Origin of the Laws of Nature

Sir Edmund Beckett
Bart.

ON

THE ORIGIN

OF THE

LAWS OF NATURE.

BY

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PREFACE.

This treatise is an extension of the 'Note on the Laws of Nature' at the end of the 6th edition of 'Astronomy without Mathematics,' which at first related to Gravity alone. It also contains the substance of two lectures at the London Institution in 1878 and 9, which many persons wished to see printed. Some of the arguments are necessarily old, but were requisite to make the general argument complete as far as it goes. Possibly none of them may be new; for I never assume that anything is new merely because I have not seen it before or do not remember it. Nevertheless I believe that some of this reasoning will be new to most readers, if not to all, and that it is worth attending to. I have given it as concisely as possible, and with no more illustrations in any case than seemed necessary, out of the infinite number which nature affords, and of which a sufficient number may be read not only in Paley's 'Natural Theology' and the Bridgwater Treatises, but in many modern books which deny the only cause that will rationally account for their origin, as I have shown here.

E. B.

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ON

THE ORIGIN OF LAWS OF NATURE.

It is the fashion with scientific and moral philosophers of a certain school to enuntiate maxims or dogmas, which they expect to be received without proof, like the axioms of geometry or mechanics. And they too often are received by ordinary readers, because they look plausible and their fallacy is not easily perceived. Sometimes perhaps their authors have unconsciously deceived themselves, not being very anxious to scrutinize too closely propositions which occur to them and are so convenient for their purpose; but more frequently they invent them to support opinions which they have adopted for some other reason but find it impossible to prove by any regular or logical process; and so they construct a maxim which secretly involves the conclusion they want, and then the business is easy if they can only get the maxim accepted. This mode of reasoning is a return to that of the 'pre-'scientific ages,' which these philosophers generally deride, and in that respect rightly, for it is the exact reverse of the 'inductive' mode of reasoning, which no

one now ventures openly to deny is the only true one in any kind of natural philosophy. Paley said, 'Nothing 'is easier to invent than a maxim'; meaning that any clever man can perform the operation which I described just now, either for the purpose of natural or moral philosophy, or art, or politics, or criticism, or any other kind of reasoning, as we see every day.

Out of the multitude of such dogmas, scattered over modern books which profess either to solve the great problem of the origin of the universe, i.e. the whole present state of things, or else to prove that it is insoluble, and that the right faith is that there is none, the following will serve as well as any for a text or specimen, as it was invented by a late scientific man of some note, and has the merit of being so ingeniously plausible that it is likely to be accepted as unquestionable, and also unusually distinct and clear; while many of such sayings are so obscure and ambiguous, and expressed in such artificial terms, that the authors may easily be supposed to mean one thing while they really mean another, if they clearly understand themselves what they mean. This particular dogma looks as if it were capable of leading to true conclusions on any subject to which it can be applied, and it is quite evident to what subjects it was specially intended to be applied. It is, that 'What we have no time to 'examine we ought to have no time to believe,' except that 'we may believe the statement of another when 'there is reasonable ground for supposing that he 'knows the matter that he speaks of, and that he

'is speaking the truth so far as he knows it': which exception at once suggests the remark, that self-evident or necessary truths, which this claims to be, do not usually admit of qualifications.

Moreover, this qualification, introduced with an appearance of candidly admitting that statements of competent persons may sometimes be received on their authority, is plainly intended to destroy all possibility of such statements being received on any question such as that of the origin of the universe or the laws of nature. For not one man in a thousand has either time or ability to investigate such a problem for himself; and therefore, according to this dogma, all the other 999 ought to believe no statement of anybody else about it, since no man can possibly say that he 'knows' anything about the origin of the laws of nature; all that the cleverest man can do is to select the most probable of the only possible theories. And the inventors of such maxims then rely upon the fact that not one man in ten thousand is aware that the most undoubted scientific theories are only demonstrable by the balance of probabilities. So on one hand they are constantly proclaiming that nothing ought to be believed which cannot be proved 'positively,' as they call it, or by the evidence of our senses, while on the other, the very thing they worship, viz. science, or theories about natural causes and effects, are never proved positively, but only by inferences and probabilities. It is quite true that those inferences are derived from things evident to our senses; but so are

all the inferences as to prime causes deduced from visible results, and all conclusions from historical evidence, which is only the record of contemporaneous observations, so far as it is true. If it occurs to any one that there are other lines of reasoning (which he may think good or bad) relating to this question, I have only to say that I do not mean to deal with any such, but with purely scientific alternatives and probabilities.

And if it be said further that any attempt to solve this problem must leap somewhere from the visible to the invisible, or from the known to what some people are pleased to call 'the unknowable,' and therefore can prove nothing, I answer that such *a priori* conclusions are worth nothing and only beg the question. The reasoning will either be good or bad on its own merits without regard to *a priori* notions of what 'must be'; which are worth nothing when we can ascertain what is. For if it is, that is decisive and final; and if it is not, that proves that the arguments that it must be were wrong, however good they seemed.

I have already said in what sense the word proof is applicable to these questions; and the objection that proof on this subject is impossible involves the common fallacy of using words in one sense which really mean another. It is true that no conclusions on this subject can be proved absolutely, but we shall find it is not true that one conclusion cannot be shown to preponderate infinitely over the only possible alternatives. All that we can say of the well-known

law of gravity is that it is shown to be immeasurably more probable than any other explanation of the motions of the universe. The undulatory theory of light and heat is at present the most probable one because it explains all the known phænomena better than any other; but there is not the smallest direct proof of the luminiferous æther which it assumes. That may be proved or disproved any day. Hardly any theory of the nature of electrical force can be said to have such a preponderating probability that it may not be superseded to-morrow. And the same is true of other scientific theories in various degrees. We shall see whether some conclusion as probable as the best of them may not be arrived at by ordinary reasoning as to the only possible modes of origin of the laws of nature. And if it can, there can be no rational justification for putting it aside by virtue of any of the ingeniously devised axioms of what has been appropriately called 'dogmatic atheism.'

I do not use that word by way of odium or prejudice. Some atheists do not repudiate it themselves; nor do I see how any reasonably can, who do not believe in a creator and maintainer of the universe. No other word expresses just that state of belief and nothing more. Nor is the distinction very clear for any practical purpose between that and what used to be called by the milder name of 'scepticism,' or the more modern and stronger one of 'agnosticism'; which mean that the sceptic does not believe in a creator, and the agnostic says it is impossible to know anything about

one. The only difference between them is that the sceptic is an atheist provisionally, or subject to a theoretical possibility of being convinced of theism, but an agnostic admits no such possibility. Not that I see much use in discussing artificial epithets of that kind. A man's belief is what it is at this moment, and not what it may become in some unknown state of things or on some new kind of evidence. Yet many men who do not now believe in a creator and never use any arguments except against one, or seriously attend to any, affect to be indignant when that is called atheism. We are not concerned with persons but with arguments, and phrases which are meant to pass for arguments. The moment we hear men talk in that way, or disguising their meaning by professing a kind of reverent ignorance of the unknown and incomprehensible, we know perfectly well that they are at present atheists, and it is difficult to see why they resent being called so, except that they often find it convenient to ride off and avoid a distinct statement of their actual belief on the pretext of 'personalities.' We might as well resent being called Christians by them on the ground that they think Christianity as foolish as we do Atheism.

Another specimen of such atheistic dogmas and phrases is that 'God, or any religion, is unthinkable,' which is propounded by some of that class of men whom it is the fashion to compliment with the ridiculous name of 'thinkers,' as if they had a monopoly of that faculty. So far as that dogma means anything

it obviously begs the whole question in dispute, and is therefore not worth discussing. It was only invented to look learned, and indirectly throw contempt on everybody who presumes to think about what such philosophers pronounce 'unthinkable' or impossible. We often say indeed that certain things are 'inconceivable,' but only when it is believed that no competent person seriously maintains them. For example, Newton said (as we shall see farther on) that a certain proposition about attraction is 'inconceivable,' and presently after, that 'no man with a competent 'faculty of thinking can fall into such an absurdity'; and no such man does. But that is as different as possible from pretending to sweep away an entire branch or system of philosophy by dogmatically pronouncing it, for no reason at all, 'unthinkable,' or anything of that kind.

I do not know that anybody proposes to distinguish what is called materialism from atheism. Inasmuch as it is only an artificial term, not expressing its own meaning as clearly as atheism does, I see no advantage in using it; and in all discussions of this kind it is desirable to use the plainest words, and to refuse to accept any others from opponents who appear generally to have a peculiar dislike of using them, and of saying distinctly what they mean. Professor Tait wrote a very sensible article in the *Contemporary Review* in 1877 against 'Fine writing in Science,' and it is specially objectionable when it is employed to disguise an author's real meaning or to avoid expressing it. Mate-

rialism simply means the doctrine that the laws of nature, or of matter and its properties, are self-existent without any external prime cause or agent; which of course is the exact contrary to the theistic doctrine that they are all due to a cause or agent which is not material or physical, and is therefore called external to matter, or supernatural. Nor is any other alternative conceivable, or propounded by any one, so far as I know.

Consequently materialism means that the universe made itself *proprio vigore*, or by the self-existing power and determination of every atom in the universe to behave as it does. I know that materialists dislike and repudiate this statement of the necessary meaning of their creed; but they can give no other that is not reducible to this. It is hardly worth while now to add mere chance as a possible alternative, though Epicurus did, and his expositor Lucretius, whom some of our atheistic worshippers of science profess to admire, notwithstanding his ignorance of science and of the fact that the idea of chance is mathematically inconsistent with any uniform laws of nature or the determination of all the various kinds of atoms to behave invariably in one way with reference to all others, according to their kind. Chance is only the uncalculated result of some known or unknown laws of nature, of which I shall say a little more afterwards.

And if only these two alternatives are possible, it is evident that every denial of one is an affirmation of the other, and that no man can rationally say that he denies a creator but does not profess to know what theory to

substitute, and that he is not bound to find one. He has found one, because there are and can be only those two. He may not yet have made up his mind which to prefer; but until he has he has the least of all pretences to set up for an authority; for though either theism or atheism may conceivably be true, as an abstract proposition, to believe neither of them is absolutely certain to be wrong, as certain as if he said he believed both. No man is bound to answer questions about his creed unless he sets up for a prophet of some kind of creed, whether positive or negative. If he then refuses to say in plain terms what it is, and whether he accepts the necessary logical consequences of it, he deserves no more attention. But many of the atheistic philosophers, i.e. those whose arguments are all atheistic, are adepts in the use of ambiguous and plausible phrases which either mean nothing or else tacitly assume the question in dispute; therefore it is, as I said, essential in all discussions with them both to use the plainest language and to accept no other from them. If they will not give it, the fair inference is that they are afraid of doing so, and not prepared to face the necessary consequences of their own doctrines.

Instead of that, the leaders of the materialistic school give us such dogmatic statements as that 'materialism 'is the best working hypothesis,' and that 'it is a funda-'mental law of psychology that all beliefs as to the past 'and the present must rest on experience.' But they neither pretend to prove that 'fundamental law,' nor to tell us who made it, except themselves, nor why a

hypothesis is the best working one which explains nothing, but merely asserts, when turned into plain English, that things are because they are; and that mind is only certain motions of matter, without professing to explain how a single particle of matter came to be able to move itself: much less to combine to produce all sorts of complicated results which are not even physical, but 'psychical,' or belonging to the mind, to use their own language. In plainer language, they mean that thought *only* consists of small motions of the brain, leaving us to find out as we can why vibrations of the brain should make thoughts without any creative power to cause them to do so, or thoughts produce vibrations, or how any vibrations can be produced without the application of force at every moment, and how force can be employed at every moment without a power and a will somewhere: all which we shall consider farther on; I am only pointing out now that all this language of the materialists or atheists or sceptics, or whatever else they call themselves, is not demonstration but mere assertion, which could just as well be made the other way.

If the assertion, that 'all beliefs as to the past and 'the present rest on experience,' were confined to things which experience could apply to, it would not be worth discussing here. But it is plainly intended not to be so confined, but to be accepted as an axiom with a much wider meaning than that. And if so it is a mere paradox and absurdity: for how can the absence of experience raise even the smallest presumption against any theory, which, if it were ever so certain, does not from the

nature of things admit of experimental proof, which the theory of the universe having been made by a creator —or without one—manifestly does not?

If physical theories do 'rest upon experience,' that only means that they are inferences from facts within our experience, which may be either right or wrong. And so is every theory of creation, whether by one creator or by any conceivable alternative. We and the atheists only deduce different theories from the same facts. Even the fundamental doctrines of theology ultimately rest on experience just as much as any physical theory, though not the same kind of experience; for they rest on historical evidence and our general experience of human veracity in circumstances which no competent person doubts the truth of history about, though they may differ about the weight of the evidence. So that all this attempt to distinguish between theories resting on experience and those resting on none is another fallacy and confusion of ideas. And the denial of any future or present spiritual existence because we have no experience of it, i.e. no direct experience, is worth nothing, until we have some new senses capable of perceiving what cannot be perceived, or it would not be spiritual.

Our automatic cosmogonists are not content with merely propounding such paradoxical dogmas as these, but they judiciously enforce them by treating those who presume to question them with contempt, as ignorant of what they call science, and blinded with antiquated prejudices and dogmas, altogether behind the age, and

their arguments as having been refuted long ago and forgotten or abandoned by all rational and well-informed persons. And so many people are afraid of being so treated, or of being thought out of fashion or behind the age, even in philosophy, of which they know nothing and would confess it if examined, that they hasten to avow that they are not, and hope that no one will suspect them of adhering to antiquated notions and prejudices which are called bigotry. Others, who confess that they have neither time nor ability to examine such things for themselves, take for granted that the confident assertions of such clever men and leaders of the scientific world must be right. At any rate they have no inclination to be treated as fools if they presume to doubt their statements, or even to inquire what they mean in plainer English than the sceptical philosophers think fit to use. Still less are they prepared either intellectually or morally to engage in a dispute with every atheist who challenges them to prove that God exists. And some think it safer to admit that perhaps the existence of a creator cannot be proved to the satisfaction of man's understanding, but must be apprehended by faith, acquired from the Bible or from men of competent learning; and some from 'intuitive perceptions, instincts of devotion 'to some supreme being,' and the like.

But whatever may be the value of such propositions to those who believe already, they are plainly of no use against those who deny them and everything on which they are founded. Consequently, if we are to

content ourselves with them, scientific atheism is simply unanswerable by the only kind of reasoning which atheists will acknowledge; I mean reasoning of a scientific kind, which does not assume the very things which they deny. I demur to that view of the human intellect altogether, and to the assertion or admission that the existence of a creator cannot be proved in the same way as any scientific theory, by showing that it accounts for all the phænomena which it ought to account for much better than any other, and especially where no more than one rival theory is possible; or in other words, that one theory is enormously more probable than the other. It is true that comparatively few persons can appreciate such proofs. But how many people have the least idea how it is proved that the earth goes round the sun, or that the sun is 93 million miles off, and 60 million times as big as the moon, or that everything in the world attracts everything else, or a hundred other well-known conclusions of science? And is everybody who does not know or cannot understand the proofs, or 'has not 'time to examine them,' bound to disbelieve them?

If it be answered that that is just the case provided for by the exception to the maxim that I quoted at first, and that persons who do not understand astronomy ought to accept astronomical conclusions on the authority of those who do, I reply, Then why are not ignorant or busy people to accept the conclusion of men of learning that the existence of a creator is infinitely more probable than the only possible alter-

native, and that it is supported by a great deal of good evidence, of which scientific men are no better judges than anybody else, even if they have studied it, which many of them never have, and utterly decline to do, being determinedly prejudiced against it?

Moreover, the unlearned may say, and ought to say to them, 'But why should we believe your doctrine 'that the world made itself rather than the opposite 'one that it did not? Yours looks very like nonsense 'on the face of it, and you do not pretend to be able 'to prove it. Therefore, according to your own maxims, 'it is our duty not to believe it.' Where one party must be right and the other wrong, and when to disbelieve both is certain to be wrong, it is impossible to give a rational reason why unlearned people should not believe, with the majority of learned ones for many ages, in a theory which is unquestionably sufficient to account for the existence of the world, rather than in another which is unintelligible to ordinary minds, incredible to many of the highest intellects on purely scientific grounds apart from all others, and accounts for nothing.

Some sceptics try to defend themselves by saying that the inquiry is idle and unprofitable, as it can never receive any absolutely certain answer, and also that it does not signify whether there is a creator or not, any more than it signifies to ordinary men whether space is full of an ætherial medium or is generally empty, or any other question of that kind. Though I am not proposing to discuss morality or theology

here, it is necessary to answer that objection, as it is obviously atheistic, so far as this. How can they possibly know that it does not signify? As a matter of fact, so great a majority of the believers in a creator believe also in our having some relation to him of infinite importance, that the connexion of the two beliefs may be fairly called universal, so that there is an extreme probability that any one who comes to believe in a creator will believe in his having some moral relations to mankind, whether the connexion of the two beliefs is a logical necessity or not. And if so it cannot be of no consequence whether theism or atheism is true.

The probability of that relation does not belong to the present inquiry, and a discussion of it cannot be interjected here. But if it were much less than it is, the possibility is quite enough to answer that objection to the inquiry, that it is of no consequence; seeing that if one alternative is true it is manifestly of the greatest importance to us. In all human affairs men have to take the consequences of acting on a wrong belief, however they acquired it. Never was any plausible maxim more refuted by daily experience than that which was invented for a political purpose and promulgated as an indisputable truth about half a century ago, that 'man is not responsible for his belief.' If we act in common affairs on the principle of listening to and looking for every difficulty or objection on one side, and never balancing them against those on the other, or even inquiring whether there are any, or never

attending to wiser men who have, we shall only be laughed at if we find the consequences ruinous, though we may be able to say also that we inquired as much as was the fashion of the time, and took for granted that as there were difficulties on one side which we could not answer, that was reason enough for taking up the other.

Therefore it is absurd and irrational, instead of being philosophical as it pretends to be, to assume that it does not signify whether theism or atheism is true, or to invent any other excuses for rejecting the former, until we are *bonâ fide* convinced, by an equally full inquiry into the difficulties of both, that the universe created itself. Multitudes of men who talk of having so inquired know perfectly well that they have not done so *bonâ fide*, but have only fed their minds with all the arguments they could meet with on one side; which they are very likely unable to answer for want of learning, and some of them perhaps nobody can answer, except by showing that the opposite theory involves greater difficulties and is therefore more incredible; or perhaps they have merely accepted a few plausible maxims which pretend to settle *a priori* the question of the ultimate cause of all the laws or forces of nature, not one of which laws could be divined *a priori* by all the intellect in the world without observation and experience.

Probability and Certainty.

As the question of the origin of the universe depends on the balance of probabilities, like all scientific theories, it will be as well to give one or two simple illustrations of the manner in which we necessarily come to conclusions founded on probabilities, but with perfect certainty in our minds that they are nevertheless right; although when there is positive and credible evidence on one side and only probability on the other, a very small amount of such evidence always preponderates over a very large degree of *a priori* probability; and there is some amount of evidence which would convince any man that the most improbable thing he can imagine did happen, if it was not actually impossible. Babbage showed by an easy mathematical calculation, in what he called his 'Ninth Bridgwater Treatise,' that a probability of a billion to one against any event is overborne by the concurrent independent and unbiassed testimony of only 25 men who each speak truth ten times as often as they lie; and that there is no degree of improbability (short of mathematical impossibility) that could not be overborne by some number of witnesses of what may be called average veracity. No amount of testimony could convince a mathematician that the circumference of any circle was only $3\frac{1}{8}$ times its diameter—not if a thousand men swore that they had each measured 1000 circles and found them so; because it is impossible, and the mathe-

matician would know for certain, and not merely *feel* certain, that they had all measured wrongly. But improbable as it is that a pair of unloaded dice should fall aces upwards 1000 times running, it is not impossible, nor indeed more improbable than any other order of throws of each die *named beforehand*, and we should believe it on the testimony of one or more people, who, we are otherwise convinced, are credible. Nevertheless we should think it immeasureably more probable that the dice were not fair; indeed we should feel practically certain that they were not, because the probabilities against the event may be called infinite,* while that against the dice being loaded or unfair is nothing very great.

Babbage's calculation was an answer to Hume's famous argument against miracles, viz. that all experience is against them, while lying is not at all contrary to experience. But that again is a mere paradox, or a verbal trick which either begs the question or is absurd. For if by 'all experience' he meant literally all experience, that simply begs the question; and if he meant only general experience, it sinks into the platitude that miracles were uncommon, and have ceased; which is not the smallest proof that none ever happened, especially as they have done their work. Again, if the prevalence of lying were a sufficient reason for disbelieving any extraordinary story, then we must not believe that any extraordinary event ever

* They are $(36)^{1000}$ to 1, a number which must contain 1557 figures, if the dice are fair.

happened: which is absurd. No *a priori* rules as to the credibility of evidence can be laid down, and no one practically goes by any: every statement is believed or not by every man according to his own estimate of the probabilities and the evidence and the arguments he hears. One man believes and another does not on the very same evidence. And historical statements are disbelieved at one time and believed at another according to the fashion of the time, though of course the real truth or absolute credibility has been the same all along.

As there is no doubt about the facts of nature being such as they would have been if the atoms of the universe had been, as we say of dice, 'loaded' to make them behave in a particular way, not a thousand or a million times, but always, in an infinity far beyond all conception, every rational man concludes so much as this, that they are so loaded somehow, because the only possible alternative to that is bare chance; and the idea of all the atoms of the universe behaving as they do by chance is too absurd for any man in his senses deliberately to entertain. And yet more persons do entertain it than are aware that they do. For when atheistic philosophers compound a theory of automatic cosmogony out of 'self-existing laws of nature,' helped by 'accidental changes of structure' in successive generations of living things, which are assumed to be carried on and further improved automatically if they are improvements and dropped off if they are not, what does all this mean, except that they believe in the

atoms of the universe behaving as they do by chance, and sometimes performing some wonderful feats, and suddenly producing new organs, by accident? But real chance can have no existence under constant laws of nature, or any laws of nature. The falling of every grain of dust and the varying shape of every leaf, within the usual limits, are as much the consequence of some regular physical causes as the flight and falling of a cannon ball: only we can now calculate one and we cannot yet calculate the other. The only meaning of the word 'chance' in the physical universe, since it began to exist, is this sort of incalculable consequence either of the known or unknown laws of nature. Real chance would be motions of some kind from no cause at all, and antecedent to all laws of nature.

What Laws of Nature mean.

And when we talk of laws of nature being the cause of anything, as we may for shortness and convenience, we must remember that they are only statements of the observed course of nature, or the uniform results of unknown physical causes, ending in some prime cause or causes not merely physical, and it is absurd to talk of such results as being themselves prime causes. I say 'unknown physical causes' because as soon as a physical cause is discovered for any so-called law of nature, that law sinks into a necessary or mathematical consequence, and that

physical cause takes its place as the law of nature, with nothing that we know of between it and the prime cause of all things, whatever that may be. Thus it is incorrect to call it a law of nature that the planets move in elliptical orbits, though it is an invariable fact, because it is a necessary consequence of the law of gravity, which, as far as we know, is a primary law of nature, together with a primary impulse against gravity. But if some physical cause behind gravity is ever discovered, the law of gravity will sink into a mathematical result, and that cause will take its place as the primary law of nature, but still wanting a prime cause or power somewhere to maintain it.

These obvious remarks about the real meaning of 'nature,' 'laws of nature,' and the like, though continually necessary, have been made in one form or another by writers against atheism for ages. Dr. Samuel Clarke's mode of putting it nearly two centuries ago, in his controversy with Leibnitz, is as good as any:—'The terms "nature," "powers of nature," '"course of nature," and the like, are nothing but empty 'words, and signify merely that a thing usually comes 'to pass.' Butler says, 'Nature only means what is 'fixed, settled, uniform' (Anal. cap. i.). It is superfluous to quote similar sayings about 'law,' 'mechanical 'action,' and so forth, from Paley and others, for they are perfectly obvious to common sense, and no attempt has been ever made to answer them rationally. The atheists quietly ignore them, and solemnly enuntiate their maxims and phrases as if modern science had

discovered that invariable consequences will do for prime causes, that motion can be continually changed without continual application of force, and that force can generate itself—exactly the things which science has refuted for ever.

The immediate cause of every motion is what we call force. Gravity is therefore called a force, and the law of gravity is only the statement of how that force uniformly acts, or rather of how all the atoms of the universe for some unknown reason always try to approach each other with a certain intensity, which also depends on observation and could not be deduced from anything else, and least of all by any a *priori* reasoning. Necessary or self-evident truths, like the axioms of geometry, or the multiplication table, or other fundamental truths of mathematics, are not laws of nature, being independent of observation, and no omnipotence that we can conceive, or have any authority for believing in, could have made them otherwise. But every law of nature wanted making, and maintaining, and might conceivably have been different. Every law of nature is a statement that certain motions take place whenever they can, without any known physical cause; and every motion requires a force; and the force must either reside in the particles or outside them. If it resides in them it means nothing and is nothing but a design or resolution of each atom to move as it does whenever circumstances allow it, and what is more, a perpetual adherence to that design. And if it is outside them it cannot mean anything but the will or

resolution of some power which is omnipotent enough to make every atom behave as it invariably does in given circumstances, and which is also continually acting.

The second of those alternatives requires no explanation and is an undeniably sufficient prime cause, though that alone will not prove it to be the true one. I say it is undeniably sufficient, because the only attempt to deny it, by asserting that an immaterial agent or will cannot influence matter, is a mere dogmatic begging of the question, and no pretence of proof has been or can be given of it. The difficulty also is just the same if the will is supposed to be in matter itself. It is nothing to the purpose to say we cannot explain how a will acts on matter. We can no more explain it in one case than the other, if there is really anything to explain, or any gap to fill up between the facts that motion begins and that some will and power strong enough for the purpose resolves that it shall begin. No words could carry the proposition any farther. Our own free will, whether a primary or secondary cause, or our power of turning our thoughts which way we please, and doing what we please within certain limits, is a very imperfect analogy to a creative will, but it is some analogy. And every man feels a great deal surer that he has it, than any man can be of the most plausible arguments that he has not. Even if it were otherwise as to our wills, which are influenced reciprocally by external causes, though not overridden by them, that would prove nothing against a primary or supreme

will which must have existed before any physical causes, which are all only motions of some kind and therefore cannot be prime causes. And the prime cause of each motion must be a self-acting will, whatever is its mode of action, and whether there are an infinite number of them or only one. I am not now assuming that there is only one, but saying that is our theory; and as nobody can possibly refute that part of it, we have a right to use it; and is an undeniably good 'working theory' of the origin of forces, while materialism is no theory at all, but merely asserts what everybody knows without it, viz. that they exist and act.

The doctrine of self-existing forces, inherent properties and potencies of matter, and so forth, undeniably provides no prime cause at all, and tells us simply nothing as to their origin. The proposition that it is 'the best working hypothesis' is altogether a perversion of language when presented as a solution of the question of the origin of the laws or forces of nature. It may indeed be called a working theory, i.e. one to work *from*, or to calculate results from, just as gravity is a perfectly good theory to work from in calculating the motions of the universe. But our problem lies in just the opposite direction: we want to find, not the consequences, but the causes of the forces which we all know are inherent in nature somehow: we want to know how they got there. If we were to tell any of the investigators of a physical cause behind gravity that the answer to their enquiry

is that gravity is a perfectly good working theory, they would rightly reply that we are talking nonsense and do not know the meaning of our words.

Matter is the Sum of Atoms.

Let us consider the only sense in which the doctrine of inherent forces and potencies of matter can mean anything in the way of explaining how they got there. And for that purpose we must remember that matter is not a unit, as a creator is, and that talking of it so is a mere rhetorical artifice when used in philosophical inquiries, though it may be tolerated for convenience in common use when no scientific argument is built upon it. Matter is nothing but the sum of all the ultimate particles or atoms contained in the universe, or in any particular mass that we are dealing with. Those atoms, or at any rate the small combinations of them usually called 'molecules' (or little masses) which constitute the 63 distinct elementary substances (or whatever may turn out to be the exact number) are of different kinds, and most masses of matter contain several of them. Most of the atoms in the universe have never been within millions and billions of miles of each other; and according to the most received theory of the growth of the universe, their original distances were much greater, for those which are now gathered into the lumps of matter called stars and planets were originally spread over enormous distances in nebulæ.

The chief prophet of the doctrine of 'inherent

'potencies of matter' has indeed lately called that once diffused state of the atoms of 'bodies now discrete, a 'continuous mass.' But that is certainly an odd use of both those words, seeing that the average distance of the atoms of the solar system alone was prodigiously greater when they were spread over a nebulous sphere which would contain at least the orbit of Neptune, than now that they are collected into one mass, viz. the Sun, and a few planets of comparatively insignificant size, all enormously denser than any nebula. In short this mode of using such words as 'continuous mass' for a nebula of widely diffused atoms is only another specimen of the modern fashion of building philosophical conclusions on mere phrases, which are permissible in popular or rhetorical language but are quite incorrect in philosophical. Here the object was to make it appear that all the atoms were once so close together that they might be considered to constitute a unit, and readers were expected to accept at once the apparent difference between 'discrete' and 'continuous,' and not to observe that the discreteness belonged to the several lumps or masses, while continuity was used of the atoms, and did not really mean contact or even proximity, but the contrary, viz. diffusion over a vastly greater sphere than all the masses occupy at present.

If all the matter which is ponderable in the solar system were diffused into a nebula with twice the diameter of Neptune's orbit, which is a very moderate estimate of its probable size at some time, that sphere would be nearly $2\frac{1}{2}$ billion times larger than the Sun,

and the matter diffused into a gas 1800 million times rarer than our air near the earth. And this is the state of things which our most eminent advocate of the potentiality of matter calls 'continuity' by way of contrast to the present 'discrete' or divided state of the same quantity of matter among the sun and planets. No doubt the atoms in a gaseous nebula can move about and confer with each other in a way that the atoms of one solid body cannot with those of another. But I hardly suppose that he meant that they availed themselves of that facility of conference to agree upon the laws of nature which they were ever afterwards to follow. And yet if his 'continuity' did not mean something of that kind it meant nothing at all to his purpose.

But suppose the facts had been the other way, or that all the atoms of the universe had once been as close together as possible, in what might really be called with some accuracy a continuous mass, and afterwards driven far apart by heat or something else, although there is probably no actual contact of atoms in the solidest bodies, what good would it be to the theory of inherent forces or powers? The word 'inherent' passes with some people for an explanation, but unfortunately it is the very thing that wants explaining. 'Matter having inherent forces or potencies' means in plain English that somehow or other there has got into each atom the power and the resolution to move with respect to all other kinds of atoms as it does. 'Inherent' only means sticking in, and

nobody will doubt that if such a power and resolution once got into an atom it would be likely to stay there; except, to be sure, that even then it would be impossible for the energy of an atom to be revived as fast as it is used in doing any work, without some extraordinary alteration of the present laws of motion and conservation of forces, now recognized by every philosopher in the world. It is amazing that people in this boasting age of science should promulgate and accept such empty phrases as these for a solution of the problem of the origin of the laws of nature or the present state of the universe. I do not mean that it is inconceivable (though we shall find it is impossible) that every atom should have been self-existent from eternity, and that all its properties or tendencies to every kind of motion may also have been self-existent for ever. At present I am only pointing out that that is the real meaning of talking about inherent properties or powers or forces as a final explanation; and that is the theory which we have to contrast with the theory of one creator and maintainer of all those forces. Nobody has propounded any other, nor do I see what other is conceivable, when fine language is reduced to its plain meaning.

Now let us see further what follows from that theory; and first take only a single law of nature and the most universal of them all, that is, gravity, or the tendency of every atom to approach every other with a fixed intensity at some given distance and then increasing or decreasing as the square of the distance decreases or

increases, which is called varying inversely as the square of the distance. The idea of all the atoms having spontaneously adopted this law and standard of attraction by chance, before there were any laws of nature which put an end to chance, I suppose will be universally dismissed as nonsense not worth spending another word on. The only alternative is that every atom, being self-existent, had the power to adopt what laws of motion it pleased, and that they all by some mysterious universal suffrage conveyed through the infinity of space, or through the immeasureable sphere of the primeval nebula, agreed on that law and intensity of gravity, and have steadily kept to their agreement ever since. If such a proposition looks absurd it is not my fault. I defy anybody to translate the doctrine of inherent forces into any other plain and simple meaning, though it is easy enough for clever men to translate it into other forms of unintelligible or evasive and rhetorical language: which is not philosophy but mere verbal conjuring. I suppose indeed that this is only what is meant by 'pantheism,' or 'every atom its own god,' which is logically or scientifically conceivable, and is the true antithesis to theism, and what atheism and materialism must really mean in the minds of those who remember that every effect must have a cause. Pure atheism is the doctrines of effects without causes. But it is of no practical importance what these doctrines are called: the question now is what the only conceivable ones are when expressed in plain English.

Nature of Gravity.

Ever since the time of Newton philosophers have speculated on some physical cause between gravity and a prime cause of all things; I mean some simpler law of nature, of which universal attraction varying inversely as the square of the distance should be a necessary or mathematical consequence. Hitherto they have had no success. The following passage in Newton's third Letter to Bentley, for the purpose of his famous sermons against atheism, has been often misunderstood from being only quoted partially.

'It is inconceivable that inanimate brute matter 'should, *without the mediation of something else which is* 'not material, operate on and affect other matter, without 'contact, as it must if gravitation in the sense of 'Epicurus be essential and inherent in it. And this is 'one reason why I desired you would not ascribe that 'notion to me. That gravity should be innate, in-'herent, and essential to matter, so that one body may 'act upon another at a distance through a vacuum, '*without the mediation of anything else*, by and through 'which their action and force may be conveyed from 'one to another, is to me so great an absurdity that I 'believe no man who has in philosophical matters a 'competent faculty of thinking can fall into it. Gravity 'must be caused by an agent, acting according to cer-'tain laws: but *whether this agent be material or imma-'terial* I have left to the consideration of my readers.'

Although he thus left it to the consideration of his readers it is evident that his own opinion was that the ultimate agent is immaterial. Newton saw no difficulty, as modern philosophers profess to do, in an immaterial agent of sufficient power influencing matter by his will. The denial of it is an empty paradox, as I showed before. It is of no consequence whether gravity is the immediate result of that agency, or whether there are other physical causes interposed: to some immaterial agent they must come at last, unless each atom is its own agent, resolving to approach every other according to the known law and intensity of gravity, and always keeping its resolution; or else acted on by the atoms of some universal æther, whose motions would require maintenance just as much as attraction does. The speculations on the nature of atoms, ætherial and material, are much too vague as yet to enable us to say with confidence either that gravity has to act through any vacuum or not, i.e. without any real contact of atoms. Permanent contact there cannot be, or they could not vibrate under heat, whether the vibrations consist of moving about through large spaces as in gases, or of alternate expansion and contraction, which is the favorite theory at present for solids and fluids. The luminiferous æther is now supposed not to be gaseous, but continuous 'like 'a jelly,' as I have seen it expressed, though it must be a very thin one. If there is such an æther, which is not yet proved by any direct evidence, as air is, it may conceivably be made to do the business of attraction by

some kind of vibrations, which however require a continual force or cause, as I shall show presently.

As we are taking gravity as the simplest and most universal of the many laws of nature, it is worth while to notice the various hypotheses that have been invented to account for it, or rather to bring us one step nearer to the final cause of whatever is the first physical cause of gravity and other natural forces. I accidentally opened a book by one of the leaders of the school of automatic cosmogony at a passage which settled the question very simply by calling gravity 'a necessary law of space'; and thereupon I put it down again. For that is only equivalent (as any mathematician can see in a moment) to saying that gravity necessarily emanates or radiates in straight lines round every atom. But why must it radiate in straight lines, or in any lines at all: or why must it exist at all? The only other attraction that we can see, viz. electrical, does not radiate in straight lines and does not vary inversely as the square of the distance, but in a much higher ratio. Moreover the standard intensity of gravity might have been ten times or a million times greater or less than it is, for anything that we know. There is no kind of *a priori* reason or abstract necessity why it should be anything.

Some persons have thought it easier to conceive gravity as a repulsive force acting from all the atoms of the universe upon any two which are under consideration for the moment. But unfortunately that would not produce the known law of attraction unless

the repulsion acted according to some much more complicated law, and therefore still less likely to be a primary one. Consequently I do not know that that hypothesis is entertained by any mathematician, or ever has been in any definite form; and I need not say that no theory of gravity is worth attending to that does not satisfy mathematical conditions. Even Faraday, in a lecture at the Royal Institution, treated the law of gravity as being so far from self-evident or 'necessary' that he almost thought it paradoxical. It is true that he fell into a mistake from want of mathematical knowledge, to which he made no pretension, but it is singular that the atoms of the universe should have been so much wiser than the first philosopher of this century in selecting the proper law for their mutual attraction, and one which it is extremely difficult to imitate by any mechanical contrivance, while it is perfectly easy to imitate by springs and weights forces which increase instead of decreasing with the distance; and in one case gravity itself acts in that way, i.e. inside a spherical or spheroidal nebula or other mass of uniform density, in which attraction does vary directly as the distance from the centre.*

Faraday also for a time cherished the idea that gravity may be only one manifestation of some still more universal force, of which light and heat and electricity, and perhaps chemical attractions, are others. But he latterly confessed that he had never been able

* See 'Astronomy without Mathematics,' p. 35 of 6th edition; where also the smallness of this force which keeps the universe in order is described.

to find the least experimental support for it, and Faraday did not philosophize by phrases, or delude himself and others by fine language. For the purpose of this treatise it does not signify whether that hypothesis may ever be verified or not; for (as I said before) it would only put the primary law or force of nature one step further back and leave us to apply to it all the same questions about its cause, i.e. the prime cause of whatever may turn out to be the most elementary motion, whether of the common elements of matter or some others which I shall have to speak of presently.

Smaller philosophers, and persons who wish to appear not behind the age in scientific ideas, go on repeating that guess about the identity of gravity and other forces as if Faraday or somebody else had gone on discovering evidence in favour of it. But they have not; and there are such differences between them and gravity that nothing but strong evidence can justify the belief in their ultimate identity, or in their having a common physical cause, although gravity, through some intervening laws of nature, produces the vibrations which we call heat when motion due to it is stopped. Heat cannot be reconverted into gravity, or made to influence it the least, but only to expand again the bodies which gravity has contracted. These forces are temporary and variable and require an exciting cause and constant maintenance, except the electricity of the earth in a certain sense; and even that varies. But gravity is perpetual, requires no maintenance, can neither be diminished nor increased, diverted, inter-

cepted, reflected or refracted, is unaffected by heat and cold, and is independent of the attitude of the attracting bodies provided their mean distance (properly calculated) remains the same. And what is as striking as any of the differences, those other forces act between bodies substantially in proportion to the surfaces facing each other, but gravity in proportion only to the mass.

It may also be considered certain that gravity is not transmitted by vibrations of any æther or medium, as light and heat are. For if it were it must take some time to travel, as they do, viz. from the moon in a second and a third, and from the sun in rather more than 8 minutes. If it travelled even faster than that, the effect would have been perceptible between the present time and the earliest records of astronomy, in the length of the year, which would then have constantly increased, as Sir J. Herschel remarked in his *Familiar Lectures* (see note at the end of 'the Sun').

Another theory, propounded first by Le Sage of Geneva early in this century, and again lately with a modification by Mr. S. T. Preston,* is worth notice here as a specimen of the kind of philosophy which is confidently asserted as possible, and even probable, by the advocates of automatic cosmogony and self-existing laws or forces. Mr. Preston imagines a medium or æther, of what he calls 'gravific gas,' to pervade all space, or rather so much of it as is pervaded by gravity; for therein he differs from Le Sage, by limiting the operation both of gravity and its medium, coolly saying

* In several numbers of the *Philosophical Magazine* of 1877–8.

that 'it is more probable that gravity does not reach 'the stars than that it does,' though double stars unquestionably revolve round each other by gravity, or else by some unknown kind of attraction, which has to be invented for the purpose. Le Sage imagined continual streams of this gravific medium to flow in every direction from every side of infinity to the opposite side. Mr. Preston pronounces that 'fantastic'; and perhaps it is. But Le Sage would still more justly have returned the compliment if he had lived to see the alternative phantasm of gravific gas performing in an immeasureably short time vibrations right across the solar system, and the orbits of all the comets, and necessarily also as far as the solar system has ever travelled through space and is ever going to travel,* together with the equally modest assumption that gravity does not reach the stars, and that these vibrations of gravific gas atoms maintain themselves somehow without either ultimate cause or loss of energy in doing their work of driving all the material atoms together, and maintaining all the orbits in the solar system. Mr. Preston apparently feels this, but is equal to the difficulty, and summarily disposes of it with the following *dicta:* 'We require no supply of energy: 'the energy is self-contained' (whatever that may mean): 'it is simply the normal motion of the gas' . . . 'Motion is as natural as rest.'

* The solar system travels as far as several of the stars in periods varying from about 12,000 years to 70,000, which are mere specks of time in the known history of the earth.

Here are a set of paradoxes enough to take one's breath away. 'Motion is as natural as rest.' What does he mean by 'natural'? The only meaning that could do him any good is that motion no more requires a cause to produce it than rest. And that is obviously untrue. No motion can begin without a force acting in that direction, whereas rest requires none. And no motion can continue undiminished if the moving body has any work to do, or energy to expend, without a continual supply of force—unless indeed he means to invent some new fundamental laws of motion too, instead of Newton's, which are universally received as necessary truths and the basis of the whole science of motion, or of what it is now the fashion to call 'Kine-'matics'; and he professes no such intention. Moreover, even if a body moving has no work to do, or no energy to expend, the only motion that can continue without a continual supply of new force is the purely theoretical motion, which exists practically nowhere, in a straight line with uniform velocity: that only requires the initial impulse, provided it encounters no resistance and has to expend no energy in moving something else. It is evident that vibrations are as different as can be from that kind of motion, for in them both direction and velocity are changed continually, and so a new force is required every moment. Gravity, which maintains the vibrations of a pendulum, for example, is a new force at every moment, adding velocity while the pendulum descends, and subtracting it while it ascends.

To talk of 'self-contained energy' is to say that a body can both expend energy and yet retain it: a paradox which it is hardly conceivable that a man versed in the rudiments of science could admit into his mind now-a-days; much less write down and publish. And if vibrations are 'the normal motion of a gas' what does that do towards explaining how they come? 'Normal' is only a rather finer word for regular or usual. It would be just as much an explanation of gravity to say that it is the normal motion of bodies which are free to approach each other: which is really all we know about the matter, but of course is no kind of explanation, nor brings us an inch nearer to the knowledge of any physical cause for it, if there is one.

I had better add what was said of it by the late eminent mathematician J. C. Maxwell, in the article on Atoms in the Encyclopædia Britannica: Le Sage's 'theory falls to the ground if the corpuscles of gravific 'gas are perfectly elastic,' because then all their force of motion would be returned to them and none would pass on to the material atoms. 'If on the other hand 'they rebound with smaller velocity, the effect of 'attraction will doubtless be produced; but if any 'appreciable portion of the energy is communicated 'in the form of heat,' as it must be in that case, 'the 'amount of heat generated in a few seconds would 'raise the whole universe to a white heat.'

If it is worth while to say more about this most recent attempt, and the only one that is called even plausible by other philosophers, to account for this commonest

of all forces without a creative power to maintain it, we may say (subject to the above fatal objections) that if such vibrations of such a medium exist, and are maintained by some force constantly applied, and if their energy is perpetually renewed, and if the alternate difficulties of friction and no friction, which I shall state presently, are got over, and if the densest matter is infinitely permeable by the atoms of gravific gas, while every one of them that is resisted gives an impulse and therefore does not permeate freely, then the known law of attraction would result. And this is all that can be said for it, as there is not the smallest atom of proof even alleged to exist for any one of those essential conditions.

The permeability condition avowedly assumes that the intervals between the particles of the densest matter are so much greater than the size of the gravific atoms that the latter can pass through the former in all directions in the largest bodies without there being any sensible difference in the numbers reaching one side of any mass, and those going right through it at the opposite side, and vice versâ. For if there is any difference, it is evident that the attraction between two bodies would no longer be in proportion to their mass, but would be some function of their shape and attitude towards each other. To illustrate this, fill a long and narrow parallelogram on paper with dots pretty thickly, and try to draw straight lines through them lengthwise of the parallelogram without touching any of them: however regularly you have set them you

will only be able to drive through in one or two directions at the most, while you can easily get through the thin way of the parallelogram in various directions.

And if people talk about the distances apart of the dots being infinite compared with the thickness of the lines, or the paths of the 'gravific atoms,' they must remember that they have to increase the number of the dots and the space they cover in the same proportion. It is calculated by various methods that the ultimate particles of matter must be as small as about the 500-millionth of an inch, and that their distance apart in a liquid or solid is about the same; from which you may calculate that a square inch of matter contains as many particles as, if they were peas $\frac{1}{4}$ inch thick, laid proportionately near together, would nearly cover all Europe. Professor Tait also says that if the particles of a drop of water were turned into large plums or small oranges they would make a globe as big as the earth (*Advances of Science*, p. 318). It is evident therefore that the action of the gravific gas on any mass will differ greatly according to its thickness in the particular direction in which the attraction has to be measured: which is contrary to the law of gravity. And the assumption that the distances between the material atoms are very large compared with their size is actually quite wrong.

Moreover there must either be friction between the material and the gravific atoms, or not. If not, it is now proved that one set will offer no resistance to the other, as fishes wholly immersed suffer no resistance from

water except by friction:* and therefore the gravific gas will do nothing. If there is friction, then again it will depend on the thickness of the mass in each direction, which gravity is independent of.

Then as to the collisions between the atoms of the gas while vibrating in all directions 'according to the 'normal motion of a gas,' and the elasticity which may prevent energy being wasted in that way, though not by the work done on the material atoms; elasticity is only a word, expressing another law of nature requiring a power to maintain it just as much as any other change of motion. For anything we could know before experience, there might have been no such thing as elasticity; or the direct collision of two hard masses with equal momentum might have destroyed all their motion, as it appears to do with two lumps of clay, though we now know that it does not really, because their visible motions are converted into the internal motion called heat, by the action of some agent or power which must act at that moment. Altogether, this latest invention of a physical cause of gravity is so full of difficulties and something worse, that it appears much more likely that the law of gravity should be a primary law with nothing between it and the prime cause of all things; though I am far from saying that it is, or that we may not some day discover an intermediate cause, or any number of them. But when we have we shall be just where we are now as to the

* See the late W. Froude's lecture on the Resistance to Ships, in Royal Institution Proceedings, viii. 188.

necessity for a prime cause and a continually acting power and will, to maintain whatever may turn out to be the primary force or physical cause of motion and attractions of all kinds.

A Prime Cause cannot act once for all.

This question of the possibility of the laws of nature, or the forces of the universe, or the properties of matter, being started once for all, and then going on of themselves, is so important and recurs so often, that we had better consider it at once. Most people take it for granted, though on very different grounds. Atheists of all degrees assert it, for it is essential to their theories; and believers in a creator sometimes too readily assent to it because they fancy that to deny it would be to deny omnipotence. But they are wrong. Of course it is true, because it is a truism, that if the word 'omnipotence' is taken literally, nothing, however impossible, is beyond it. But it must be taken rationally, and there is not the smallest authority or reason for taking it in any other way. 'No man with 'a competent faculty of thinking' can believe that any omnipotence could alter abstract numerical truths, such as the multiplication table, or make two sides of any triangle no greater than the third. Putting aside then inconceivable omnipotence of that kind, I say that an omnipotence which has ceased to act might as well have ceased to exist; and how could a prime cause die and leave a legacy of self-maintained forces behind

it; for they would have no other maintenance then? Such a power, if it ceased to act, might leave any quantity of dead matter with no tendencies to any kind of new motion: but the moment you want new motion you want a present cause for it.

The fundamental idea of force is only the immediate cause of motion, and it is expressed mathematically by the velocity due to it at every moment. Every one who has learnt the rudiments of mechanics knows that 'gravity' (at the earth's surface) simply means 32·2 feet of velocity per second, which is the standard for calculating gravity for all other masses and distances. The word 'force' is only the name for the unknown agent which imparts that velocity or some other to bodies free to move. The first of Newton's universally received 'Axioms or Laws of Motion,' is that 'Every body perseveres in its state of rest or 'of uniform motion in a straight line (by virtue of its 'inertia) unless it is compelled to change that state 'by some impressed force.' Whence it follows that every non-uniform motion, either in velocity or out of a straight line, indicates the action of a continued force ('constant' in mathematics means uniform as well as continued); and no motion that exists within our experience is uniform both in velocity and direction, i.e. in a straight line. Pressure is only initial motion resisted. The second law of motion is that 'The 'alteration of motion is ever proportional to the motive 'force impressed, and is made in the direction in which 'that force is impressed,' at every moment.

All the motions in nature resolve themselves into continuous ones, but not straight and uniform, and into returning ones or vibrations, which may either be as large as the planets' orbits (regarding the sun as stationary) or as small as the invisible vibrations of light, heat or electricity. The first vibration that was ever made by a particle of matter required one or more forces acting at every momentary change of direction or velocity, i.e. all through the vibration; and every subsequent vibration just as much. If gravity were to cease suddenly, every pendulum in the world would cease to vibrate, though it had been making perhaps millions of vibrations all alike till now. But though they were alike, every vibration and every part of it were changes of motion and velocity, and therefore could not take place without a force impressed at every moment. Attraction, or the disposition to move, requires a present force in just the same way. If attraction ceased no pressure would continue for a moment; i.e. it is impressed at every moment by some agency, which can only be a power with a will. The moment the will ceases, the exertion ceases and the action stops, just as pressing our hands together does. A will can begin to act at any time and at every moment, and if it does not act afresh at every moment all the previous exercise of it goes for nothing towards generating any fresh motion. We must exert a will to lift or hold up a stone, and the moment that will ceases the stone drops. The force that pulls it down requires a present will somewhere just as much as that which lifts it. It

does the atheists no good to say that our will is the result of physical causes, even if they could prove it. That only sends us farther back to find the original will. The chain of physical causes may be as long as they like, but a long chain requires a will to pull it at the far end just as much as a short one, if it is to move at all.

It is also to be observed that a prime cause acting once for all, and then ceasing, contravenes the principle of 'continuity,' which is a fundamental one with the spontaneous evolutionists or disbelievers in a creator. So they at any rate are precluded from holding any discontinuous prime cause, and must choose between the alternatives of none at all, and an eternal one—eternal both ways; for such a power evidently could no more suddenly begin than end, whether we believe in 'continuity' in other respects or not.

It is true that we speak commonly of effects being due to causes that have ceased long ago. But that only means that things which happened long ago, by virtue of the continually impressed forces of nature produce certain effects now. Without the maintenance of those forces they could have produced no consequences at all, except uniform motion in straight lines. The push which started a pendulum, years ago perhaps, was converted into vibrations by gravity, which has also maintained them. Without that the original push would have only sent the pendulum as far as it had room to go. Everything existing now may be called

the consequence of acts done thousands of years ago, in the sense that if they had been different the present result would have been different. But that is only half the question. If the planets had not been moving in the direction they were 1000 or 1,000000 years ago they would all be in a very different position now; and in that sense their position and motion a million years ago may be called the cause—or rather, a cause, of their position and motion to-day; but if the sun's attraction had not acted all the time they would have been nobody knows where now. Therefore that mode of talking of events long gone by as the causes of things being what they are now, is imperfect, and does not the least affect the proposition that nothing happens without a presently acting cause or force which must come from a presently acting will somewhere; and that a prime cause acting once for all could not have produced anything except uniform straight motions of every atom in the universe, and occasional stoppages by collision.

But now for the alternative hypothesis that the laws of nature or properties of matter can as easily go on self-existing as they can begin. I daresay they could. But we have not learnt yet how they could begin. And as a law of nature is only a statement of regular facts, or a regular and uniform mode of action of something that has power to act, and a prediction of its continuance, a 'self-existing law' is an assertion that all the motions of all the atoms of the universe once began, and continually change, without any cause at all. For all

their motions are changes of motion. If the atheists say that we have not told them how a creator could begin to exist, we answer that he could not begin at all; on the contrary, whatever power or powers made the laws of nature must evidently have existed always; though the forces and laws have not.

But there is an infinite difference between the difficulty (if any) of conceiving one such power, and of conceiving as many as there are atoms in the universe, all having resolved by universal suffrage to act for ever in the various ways they do, and always adhering to that resolution: which means resolving afresh at every moment and always acting on that resolution. A power can be self-existent, but a law can not. If you like to regard it as an obligation rather than as a statement and a prediction of results, no obligation can either make or enforce itself. You might as well talk of Acts of Parliament making and enforcing themselves, and of men being imprisoned, flogged, or hung automatically, without any agent to perform the operation, if they break them, as of laws of nature enforcing themselves. We say indeed that a man kills himself if he does what is certain, according to experience, to produce his death; but that only means that we know by experience that whatever power maintains the laws of nature will then act so as to cause his death: there is nothing more automatic in that than in a stone falling; which tells us nothing of the prime cause and maintainer of gravity.

The Forces and Laws of Nature cannot have existed always.

There is another difficulty about self-existing laws, or potencies of matter. I suppose everybody admits that any self-existence, of either matter or power, must have been eternal, or that matter or power cannot possibly have started out of nothing at some definite time automatically. All philosophers seem to agree that the universe, and every world in it, must be progressing, by what is called 'dissipation of energy,' to a state of final uniformity of heat, unless some interference occasionally takes place, of which we know nothing, and which all the deniers of a creator especially believe to be impossible. The planets have an infancy of gaseous and fluid and burning heat, a cool maturity adapted for life, and a frigid death, as Mr. Proctor has explained in several of his treatises. (See especially his *Science Byways*, p. 15.)

Professor Tait says in his *Advances of Science*, p. 146, 'The ultimate form of the energy of the uni-'verse must be that of heat so diffused as to give all 'bodies the same temperature; and whenever heat is 'so diffused it is in a condition from which it cannot 'raise itself again. In order to get any work out of 'heat it is absolutely necessary to have a hotter body 'and a colder one'; just as room to fall in is necessary for a weight to do any work: a small waterfall will turn a mill, but an ocean of standing water will not;

nor would steam do any work in an atmosphere as hot as itself, and with no fire to heat it any more, because then it could not be condensed.

Let this complete dissipation take any number of millions of years you can imagine, they are still nothing to eternity. Therefore, if the universe with all its present forces existed from eternity, and has never been helped by external interference (which would be a new force impressed) it must have worn out innumerable ages ago. The moon is believed to have lost all her heat now in consequence of her smallness. Jupiter and Saturn, from their great size, retain the heat of incandescent youth. The earth, which was once melting hot from the original concussion of its atoms by attraction, is now in a state of maturity and fitness for maintaining life, and so perhaps are Mars and Venus for some kinds of life. It is calculated that if the Sun was composed of two half suns meeting with a velocity of something under 500 miles a second, the concussion only generated heat enough of the present temperature to last 50 million years, which is a trifle compared with the requirements of the evolutionists. If this had all been going on from eternity these variations of heat would all have 'dissipated' into a dull uniformity a smaller eternity ago. Therefore, if the dissipation theory is correct, it is mathematically certain that the present forces of the universe have not existed from eternity, and consequently that they are not self-existent or always inherent in matter, but that they were brought into existence or created at some definite

epoch, and therefore by some antecedent self-existing power.

Even if the final dissipation of heat should turn out to be counteracted by some unimaginable cause, the same conclusion must be come to, that the universe has grown into its present state in time and not from eternity. Our philosophers are now calculating, rightly or wrongly, how long the sun can have been hot, how long certain geological conditions of the earth have lasted, how long it has taken the earth to cool after it became solid for any considerable depth, and so on. In such calculations millions of years are used as units and trifles; and they are trifles compared with eternity. It is quite possible, as science advances, that such calculations may acquire a considerable amount of certainty, especially those depending on astronomical or any other mathematical deductions from ascertained facts, such as Dr. Croll's well-known calculations of the former glacial periods of Europe.* We may some day be able to calculate how long the solar system has taken to get into its present condition from the supposed primitive condition of that large nebula which we considered before. Or that condition may have been preceded by some still more primitive one, as of a solid block of matter afterwards melted and vaporised into a nebula by sudden or gradual infusion of the vibrations that we call heat. But all these operations, and every conceivable operation, must have taken time and not eternity, or must have

* See his 'Climate and Time,' or my 'Astronomy,' p. 53.

had a beginning. This argument is in substance as old as Bentley's Sermons on Atheism, and therefore was probably approved or suggested by Newton, and it has acquired greater force from subsequent advances of science.

The same applies to the whole universe. Nobody doubts that gravity is universal (except indeed the author of the theory of the gravific gas not reaching to the stars); and therefore it is evident that the distance of every particle in the universe from every other represents some force that has at some time been employed to separate them against gravity, which force is given out again as bodies come together, on the principle of 'conservation of energy,' as Sir W. Grove's 'correlation of forces' is now called; which means that no force is ever destroyed, but only converted into some other manifestation; which is itself a law of nature, proved by a very wide induction, but undemonstrable *a priori*, and requiring to be accounted for as as much as any other. If it be supposed that the universe consisted first of universally diffused atoms, then gravity must have been turned in upon them at some epoch, and at the same time some universal whirling motions given to balance gravity by centrifugal force: which is another definite beginning, and breach of continuity.

If it be said that all the motions and forces in nature may have been going on together from eternity, and that we only see one of the infinite number of phases that the universe has had in the infinity of

time, I reply that the composition of atoms into molecules must have taken place at some definite epoch, whether the atoms are all of the same kind or not before that composition, which nobody yet knows. No answer that I know of has ever been given to Sir J. Herschel's well-known saying, that molecules are a manufactured article; and to talk of a manufactured article existing from eternity is nonsense. Nobody imagines that any force exists now which compounds atoms into molecules. That was all done once for all, by an act which was discontinuous both at its beginning and its end.

The same kind of calculation which is possible to us for the solar system would be possible to some higher kind of intellect for the whole universe, and the time of every phase of it could be calculated: which is inconsistent with the idea of its having gone on under any constant laws from eternity. Yet, as Samuel Clarke said early in the last century, 'it is quite 'certain that something must have existed from 'eternity.' That something we see cannot be the universe with its present laws and forces. Therefore it can only have been either self-existing atoms with power in themselves to start all the natural forces by universal suffrage at some time when they pleased (which absurd but necessary alternative Clarke did not put), or else one self-existing power and will, which he at once treated as a necessary consequence of the former certain truth.

Self-existent Matter.

If it is thought inconceivable that matter should ever have been created, it is no easier to conceive it self-existent. For what is matter without its qualities or properties; and what are they? They are nothing but the peculiar motions and attractions of all the elementary kinds of atoms or 'molecules' of matter. Every one of those motions or attractions requires a power to maintain it. Therefore, if matter was self-existent from eternity, it cannot have been such matter as exists now, for we have just seen that the forces which make it so, by giving the proper motions and attractions to the different kinds of atoms, must have begun at some epoch. Consequently, on the automatic theory, dead atoms with no properties must at some definite time have spontaneously divided themselves into 63 groups (or whatever the number may be) and adopted for themselves, first, the universal force of gravity, and then each group adopted all its own peculiar attractions and motions with respect to its own kind and every other besides. If this is perceived to be absurd and inconceivable the only alternative is a power existing from eternity, which made all the different kinds of matter what they are, at some definite time; and also gave them their initial motions in some directions contrary to gravity.

Even that absurdity however is exceeded by the other necessary hypothesis of that theory, that the atoms could go on resolving for ever to act as they do,

so as to produce what we call the laws of nature, but which are really only results. It seems to be forgotten that resolutions do not enforce themselves, any more than laws, but require continual action. In that respect there is no difference between a single atom and that congeries of atoms which for the time makes up a man: at any rate atheistical philosophers admit none: according to them it is 'matter (i.e. the atoms of it) 'that has the promise and potency of life,' and man is only a machine resulting from their spontaneous action under laws and forces which always existed without any cause. But if the most determined man in the world resolves ever so firmly to walk to a place a mile off, that initial resolution will never get him there unless he further resolves at every moment of his walk to take the next step, and takes it. It is useless to try to answer this by saying that our resolutions, and what we call our wills, are only physical results of antecedent physical causes. First of all, that is a mere assertion which nobody can prove, and which every man feels in himself is not true, or that he can do as he likes within certain limits. And secondly, if it were proved, it would not affect the main proposition: it would only reduce the above analogy to an identity, or a man absolutely to a machine or a congeries of atoms brought together somehow; and exactly the same difficulty would remain, that no machine can work without a constant supply of force from somewhere, as from gravity in a water-mill, or burning of coal in a steam-engine, which the constant

action of some power and will causes to produce all the known effects.

Uniformity no argument against Will.

But it has been said that a will which always acts uniformly is the same as none at all. I should like to know why. That is only another of those plausible dogmas which are mere verbal artifices or fallacies assuming the very point in dispute. This assumes that the power acts uniformly because it cannot help it; in which case the dogma would be in a manner true, but not so as to do the propounders of it any good, because it would only imply that that power is controlled by some other which wills that it should so act uniformly. And how could a self-existing power or will ever cease to exist, whether it was in the atoms or outside them? All parties agree that there must have been once a self-existing power somewhere, or a multitude of them; and whenever it first acted it must have acted under a will. Therefore the problem to be solved by those who deny its continuance is how to annihilate it. Force is universally admitted to be indestructible. Is the power behind every force more destructible or capable of dying?

But there is no foundation whatever for the assumption that uniformity of action is improbable under a single creative will continually acting, knowing what we do of the condition of the universe. No doubt we should have thought it most improbable beforehand; for we

cannot but feel that if we had had the making of the world, with the utmost power we can imagine and the highest scientific intelligence (which some people say human intelligence is), we should have had to be mending it up and interfering continually; since we do not even understand how many things in nature work, even with their operation and construction before us; much less could we have invented them. But atheistic philosophers are always insisting on the fact that whatever powers have made the world, have made it and kept it going and improving by means of invariable laws or modes of action. Then if uniformity of action *of the proper kind* can do the business so well, why should it be varied? This argument against a creative will in other words asserts that there can be no such will because the plan and rules by which it acts are so good that they have never to be varied in order to repair a single defect or produce a single improvement; i.e. 'there is no creator and maintainer of the 'world because the design was so perfect. If we had 'seen the universal machine working by fits and starts 'we should certainly have admitted that every one of 'them involved a fresh application of power; but we 'deny any because it works so smoothly that it seems 'to go of itself, though it is always turning out pro-'ducts of infinite variety, and in some respects continu-'ally improving.' Such an argument as that only needs stating nakedly to answer itself. I express no opinion whether those philosophers are right in the proposition that no interference with the ordinary course of nature

ever did take place since the present laws of nature were established (excluding also the question of miracles). For this purpose I assume that they are right, and only remark upon it further, that if they are, it enormously magnifies the designing power that has produced the universe by acting on a plan so good that it has never had to be changed or helped in the smallest degree. A machine that will go on for ever producing ever-varying and ever-improving results is manifestly and infinitely superior to one that wants continual interference, and implies infinitely greater wisdom in the maker of it.

Even if the theory of 'gravific gas,' or any other universal medium in spontaneous motion, were tenable, and sufficient to account for that universal force without a constant will behind it, it would plainly do nothing towards accounting for the different behaviour, in all respects except attraction, of every atom of all the 63 elementary kinds of matter. Somehow or other they all divided themselves or were divided, or manufactured into molecules of that definite number of groups with so many distinct modes of action, which those of each group resolved to follow and do follow as regularly as they all obey gravity. And all modes of action are only modes of motion, or readiness to move in a certain way as soon as they have the proper opportunity: which again means a will somewhere, either one will ordering them all, or else as many wills as atoms, and all agreeing how to act in all possible circumstances.

Not only do we know that gravity acts on the stars, making the double ones revolve, as we can actually see, but we know that there is hydrogen, for instance, in some of them, and that it behaves just as hydrogen does here, though they are so far off that the occasional conflagrations of it there last much less time than their light takes to come here, and they have ceased long before we see them. We receive iron in meteoric stones from beyond the limits of the solar system, and it behaves here just as if it had been dug out of the next field and melted here. I read somewhere of a sword being made of meteoric iron. By what sort of self-existing power did those distant atoms agree that they should behave as hydrogen and iron respectively for ever, and how do they keep up the respective motions which indicate their nature? A theory of self-existing laws of nature that will not answer such fundamental questions as these in some intelligible way, and not by mere evasive phrases, is obviously worth nothing, and indeed is no theory at all, but a mere restatement of the facts of nature in fine words pretending to account for them. To call powers or laws or forces or motions or properties of matter 'self-existent,' 'inherent,' 'normal,' or anything of that kind, is merely to tell us that they exist; which everybody knows just as well as the philosophers; and the philosophers obviously know no more than anybody else why or how they exist—and indeed much less, if they deny that one self-existing and eternal power made and maintains them; for that is a plainly sufficient explanation, and there-

fore a good scientific theory until it is superseded by a better, which they have not got, and cannot even propound one in intelligible terms.

The necessary number of independent laws of nature is far greater than is usually thought of: in fact it is innumerable. For every kind of atom knows how it is to behave not only with respect to every other of all kinds, but to all possible combinations of them, and in all sorts of circumstances of temperature, distance, and everything else. For anything we know, every one of those laws or constant habits might have been different. And yet they all fit together, either by good luck (which is nonsense) or by design, so that they have produced the universe. Which is the most likely place for that design and mutual adaptation to reside in? the atoms themselves, by universal suffrage, or a single mind and power outside them?

Life.

There is another thing which every atom of a certain number of the 63 groups or kinds has agreed with all the others to do whenever they have the opportunity; viz. that whenever they come into contact with certain collections of atoms which for the time are in the state that we call life, they will behave differently from usual, and join that living body of atoms, and go on for a certain time defying the ordinary chemical forces by some stronger ones of their own, and will keep up and increase the size of the living body for a time,

though continually throwing off some of it; and among other things, will make and throw off seeds of one kind or another, which have the power of associating other atoms with them afterwards and gradually building up a creature which sooner or later becomes like the one that cast off the seed. But they have also agreed that they will only go on doing this for a time, which may be a few minutes, hours, days, years, or centuries, and then they surrender themselves to the common chemical forces and fall asunder. Again, they have this odd humour in many cases, that if some of the wrong sort of atoms or compounds of them get into one of those living masses, they are not thrown off as useless, but the mass first absorbs them and then itself dies and submits to the common chemical or inorganic laws, being what we call poisoned. And these poisons may either be themselves alive, as in some fruits, and the stings of some small flies which kill large animals, and the venom of snakes; or dead, as arsenic or prussic acid, which sometimes enters into life, as in those very fruits and some others.

This is what our automatic cosmogonists really mean when they talk of 'matter having the promise 'and potency of life.' 'Promise' they would probably abandon on reflection, as being either simply rhetorical and unscientific, or else implying that some one had promised who had power to perform; and if so the potency is in him and not in the atoms of which matter dead and living is composed. 'Potency of life' moreover necessarily means that dead matter or atoms had the

power and will at some epoch to combine for the first time into a living body; and not that only, but to make and throw off seeds capable of associating with them other atoms of the proper kinds so as gradually to generate another living body, to be at some period of its existence like the first and with the same reproductive power. If we suppose an apple-tree to have once grown somehow, and to have somehow got power to produce seeds, that would not produce any more apple-trees, unless the seeds, and all the adjacent atoms that are wanted, had the power and the will to combine and grow into another apple-tree. The first hen that laid an egg performed a wonderful feat enough, but it would have done no good unless the atoms of the egg also knew and resolved what to do to turn themselves into a chicken. Yet spontaneous evolutionists are in the habit of slurring over generation as a thing too 'natural' and therefore too easy and simple to require explanation, and as if all they had to do was to suggest some ingenious expedients for improving the 'accidental changes' which they assume to occur without any particular cause. Generation is an independent problem from the origin of life, and quite as difficult.

They are also in the habit of saying that we need no proof of the theory of spontaneous developement because we see every seed or egg develope itself into a creature as different from it as a man is from the most elementary animal. But that again is a mere verbal fallacy, which uses the same word in two senses, begs the question, and involves a false analogy. First,

we do not see spontaneous developement, but merely developement as a fact, which tells us nothing at all about its causes, either secondary or primary. Secondly, there is no analogy between the increase by insensible degrees of a seed into a tree or an animal which retains its personal identity all the time, and the rising up of a new person different from its parents, though that second person also grew from its own egg or seed. In the first case we want to know what makes the seed attract the proper kind of adjacent atoms and assimilate them, or makes the atoms in the egg arrange themselves into a bird: in the second case we have not only to learn that, but this besides, viz. why the assimilation or the arrangement has occasionally taken an improved form different from what it ever did before. Even if we knew that it had been occasionally doing so from eternity (which we know that it has not) that would bring us no nearer knowing the cause of it, if it is not the constant action of a creator.

It is a curious retribution, as well as creditable to the honesty of the most eloquent prophet of that doctrine, that he has been compelled, if not converted, by his own scientific investigations, to become the most zealous and successful demonstrator of the fact that life never generates itself, but is always begotten of some other life: which must therefore have been created at first by some living power, and not by dead atoms. And if once, then always, just as every actual motion and tendency to motion must be continually maintained by a force and a power acting at that moment. Not

that such a power would be required any less if it could be proved that life ever did begin from dead matter. For it would always be a new set of motions, and therefore would require a will and power to produce them, as I explained at p. 44. So that all this figurative talk about matter having the potency of life is first contradicted by facts, to the conviction of the author of it himself, and if it were not we should be left in exactly the same difficulty of accounting for any life beginning, and being transmitted by seeds, without either an independent will in every atom that can help to compose a living body, and universal agreement among them as to all the necessary laws, or else a single independent will and power over them all.

If you are inclined to put aside this notion of spontaneous individual action and co-operation of the atoms, as if it were a kind of bad joke of mine made for the purpose of controversy, and too absurd to be seriously entertained by any scientific materialist, you had better consider first, that the aforesaid prophet of the doctrine of inherent potencies says in reply to one of the criticisms of his famous Belfast address, 'I define matter 'to be that mysterious thing by which all this is accom-'plished,' meaning in short everything that is accomplished, from the smallest motion up to the highest life. This again is an odd kind of philosophical language; for certainly the words 'mysterious thing' do not contribute much meaning, and the sentence amounts only to a definition that matter is everything that moves or exists, together with an assertion that

everything does everything that is done, without help from any external power. That may be true or false; but it certainly requires a little proving, and is not to be settled by a definition—except indeed a dogmatic ‘ definition of doctrine,’ as theologians say. But as matter is indisputably the sum of its atoms, this is a distinct assertion of the doctrine which I imputed to these philosophers, that everything is done by the spontaneous will and co-operation of the atoms, which must then have the same powers as we attribute to a creator, including foresight and design.

The same is proved to be their doctrine, if you think it looks too absurd to be so, by the following passage in Haeckel’s ‘*History* (?) *of Creation*’ (i. 302), who passes for a high authority in that school and by no means as an individual paradoxer whom they would generally repudiate; and you will see that he perceives no less than I do what is the only real and possible alternative to a single creator, though he thinks it prudent not to go any farther and consider how all that individual action and co-operation came to be agreed on by the atoms :—

‘ No sensible person supposes that carefully devised
‘ institutions, which have been established for the good
‘ of the whole as well as for the individual in every
‘ human state, are the results of the action of a personal
‘ and supernatural creator acting for a definite pur-
‘ pose. On the contrary, every one knows that these
‘ useful institutions of organization in the state are the
‘ consequences of the *co-operation* of the *individual*

'*citizens* and their common government, as well as 'of adaptation to the conditions of existence of the 'outer world. Just in the same way we must judge of 'the many-celled organism. In it also all the useful 'arrangements are solely the natural and necessary 'result of the *co-operation, differentiation, and perfecting* '*of the individual citizens*, the cells, and by no means 'the artificial arrangements of a creator acting for a 'definite purpose. . . . Let us pursue the individual 'developement of the body a few stages further and 'see what is *done by the citizens* of this embryonic 'organism.'

I suppose this kind of writing passes for philosophy with some persons, or is taken for granted to be so, when it comes from men who are undoubtedly proficients in mere physiology. But it is hardly credible that they can so deceive themselves, or imagine that they have said a single word towards solving the problem which they pretend to solve. It is obvious that a 'cell,' or whatever else they like to call the constituents of the 'protoplasm' (meaning a primary formation) which they say is the element of all living bodies, required 'the co-operation of individual citizens,' the atoms, to make it, just as much as the cells themselves must co-operate to make living bodies. The President of the British Association of 1879 said, 'The 'chemical composition of protoplasm is very complex,' and 'no one can deny it is itself alive,' and therefore its life wanted starting. Haeckel himself admits in another place that there is no escape from the

ultimate dilemma between the automatic action of the will of the atoms on themselves and the action of an external or 'supernatural' will upon them, i.e. one above visible nature. He would be puzzled to explain why he should call the latter 'miraculous' rather than the former, as either of them was equally new and contrary to experience when it began the work. Yet with only another of those verbal artifices which we meet with in such profusion in the writings of materialists he says, implying that any miracle must be incredile: 'At one part of the history of develope-'ment' (i.e. at the very beginning) 'we must have re-'course to the *miracle* of a supernatural creation, if we 'do not accept the hypothesis of spontaneous genera-'tion. The creator must (in that case) have created 'the first organism, or a few organisms, and given them 'the capability of developing further in a *mechanical* 'way. I leave it to my readers to choose between 'this idea and the hypothesis of spontaneous gene-'ration.'

He plainly intimates afterwards that he shall think his readers fools if they do not prefer the latter alternative. Darwin perceived the same dilemma to be inevitable, but nevertheless preferred the former alternative. Spontaneous generation was looking up when Haeckel wrote, much more than it has been left by Tyndall's more careful investigations. But if their result had been or ever should be different, spontaneous generation would equally mean the new and therefore 'miraculous' action and co-operation of the will of

individual atoms to make whatever they first began to make in the direction of life; and the philosophers will have equally to choose between one creator making them co-operate as he pleases, and as many creators as there are atoms, to settle their modes of co-operation. So that the ultimate dilemma remains the same, between one creator or maker of the laws of motion or properties of every atom, and an infinite number of them. There is no magic in the word 'creator': it only means the original self-existing cause and maintainer of the behaviour of each atom, which must evidently either be in each of them or else outside them all, and yet present with every one of them, or omnipresent, at least wherever there is matter in the universe or the action of any force across a vacuum. Haeckel uses the word 'mechanical' evidently to imply that generation once begun can go on of itself; but that is just what no machine can do without a continual supply of fresh force or power; and therefore it was the very worst word he could have used for his own argument. The machinery of the universe must stop directly if it were not kept going by a constantly applied force and will.

'The highest intelligence.'

It is a necessary consequence of the automatic theory of creation, or the absence of any prime cause, that either human intelligence is the highest in the world (and materialists say it is), or else that that

highest intelligence belongs to the atoms, whose co-operation we have just been speaking of, and which, if there is no other creator, have undoubtedly produced the world, and all that is in it, by their own inherent power and will. It is by no means easy to understand how a product can have more intelligence than its primary producer. For intelligence is a power, not a mere result or quality like beauty, which may be produced by a power which itself exhibits none, as a beautiful picture or statue may be produced by an ugly man. And what can we do with all our intelligence, in comparison with what the self-existing powers or power of the universe have done? Nothing, beyond combining the things made for us by nature, as in making buildings, pictures, machines, and other dead objects, or in leaving nature to produce further alterations in living ones, as when we plant vegetables or hatch eggs by artificial heat, or invite nature to improve a breed for us by selecting pairs of the best kind. We do not know how or why any seed becomes a living thing and ultimately like its parents. We do not even know what matter is, or what kind of things its ultimate atoms are, or even those elementary compounds of them called molecules. When mathematical philosophers invent such complicated forms for them as 'vortex atoms,' or rings continually turning themselves inside out,* it can hardly be said that 'the 'highest intelligence in the world' has any definite idea of its own physical constitution, and much less

* Of which a picture may be seen in Tait's 'Advances of Science.'

of its metaphysical. And it is certainly somewhat paradoxical and absurd to maintain that atoms with no intelligence at all have produced machines or organs or contrivances which this highest intelligence has not learnt to understand yet, with unlimited opportunity to examine them.

The power that continually contrives that rather more men than women should be born evidently knew that the waste of male life would be greatest, so that there are always rather more women left than men. We have not even got so far as to know why any child is male or female. Nobody yet thoroughly understands the whole theory of flying, though we are seeing it continually, and have unlimited opportunities of examining all sorts of wings. The explanation that appears plausible for one kind, not only will not do for another but seems refuted by it. We are constantly discovering new complications and processes, and what to all common sense appear contrivances, in the organs of all living things, and indeed we can find no limit to them; and we do not completely understand the action of some of our own. We gradually learn a little more of electricity, but we do not yet know what it is, though galvanic batteries are as old as the first electrical eel, whenever he was born. We do not even know what that commonest of all forces, gravity, is. That, and infinitely more ignorance of nature, is the condition of the 'highest intelligence 'in the world,' if that is ours. So we are again reduced to a choice between two only possible alternatives for

the supreme intelligence of the world, or perhaps three, if one of them is not too absurd to mention. That one is the intelligence of all the atoms themselves in adopting their own laws of nature. The second is our own intelligence, which according to atheists has grown spontaneously from nothing, from no more intelligence than a stone's. So that is equivalent to saying that the world lasted for millions of years and went on improving without any intelligence anywhere; or else that alternative reduces itself to the first. The third is the old-fashioned theory of one supreme intelligence and power, able both physically and intellectually to design and produce all things, though by processes or modes of operation yet unknown to our very inferior intelligence. The sufficiency of that theory at any rate is undeniable. If any philosopher can invent any other besides these three, or show us any rational reason for preferring either the first or the second, let him do so. Nobody has done it yet, and until it is done the third has every possible scientific claim to be preferred; for the first is ridiculous, and the second is inexplicable, and incompetent to explain anything.

Ipso facto design.

The highest degree of intelligence which we could conceivably attain, and possibly may some day, would be such as to enable us to foresee or calculate all the consequences of the laws of nature, as we can now some

of them. But that is an infinitely smaller power than that of starting and maintaining all the forces of nature, or than the power of any single atom which has adopted its own course of action and maintains it, which is the necessary meaning of 'self-existing laws' or potencies of matter.' If we adopt the only rational alternative, that they are not self-existing, but impressed by some one power, it is inconceivable that such a power as that could not foresee all the consequences, when even we can calculate many of them with our infinitely smaller capacity, which must have somehow come from that which produced all things.

But a power which has produced all things and necessarily possessed the infinitely smaller power of calculating the consequences of the laws by which it worked, did *ipso facto* design or intend those consequences. It is no answer to say that men often do foolish acts which they know will produce bad consequences, but yet cannot be fairly said to intend them; that many a man does what he knows will shorten his life for the sake of a little present pleasure, or because he thinks it his duty, without actually intending to kill himself. The word 'intend' is there an ambiguous one. The man does not wish for the bad result, but runs the risk of it, however great. If he is certain of it in a general way, as many drunkards are, and as men who regularly spend more than they have must be if they think at all, then they do deliberately intend to have what they call 'a short life and a merry one,' and some avow it. Every man is justly held by law and

common sense to intend the certain and even the probable consequences of his actions, when they happen. Other people may think him all but insane to choose so little present pleasure at the cost of so much future evil: but still he does choose, or design it, knowing the consequences. Moreover men did not ordain the laws which bring the consequences of their acts; but the power that produced the universe did; and therefore the design in that case was still more complete.

This is a sufficient answer to the attempts of some modern philosophers to refute Paley's well-known argument that all the animal organs must have been designed for the purposes for which they serve, just as much as a watch was designed to show the time, by saying that watches do not grow. Paley, who was the first mathematician of his time at Cambridge, knew that as well as our cleverest modern atheists, and was as good a judge of reasoning as they are. He certainly did not suppose that that, or any other analogy, could absolutely prove anything, though it may be a good answer to objections, for which purpose only his predecessor Butler also used it. It was of no consequence to that argument how the design was worked out; whether an elephant appeared as suddenly on the scene as a watch does, or was developed gradually out of other ancestors, a theory not then invented. The question is whether machines (which our atheists consider all animals to be, including themselves) infinitely more complicated than watches, and full of contrivances adapted to a variety of functions, could come into

existence without design somewhere. Paley contented himself with the natural common sense conclusion, which every man not biassed by some peculiar theory at once comes to, from a vast number of specimens which he adduced. Our new philosophers deny it, and therefore it is necessary to go a little further, and show that the *primâ facie* conclusion is also the only rational one, because the only other possible conclusion involves improbabilities which may be called infinite. For it assumes that the power which was omnipotent enough to produce all nature by an uniform course of action was yet so feeble as not to possess the very inferior and merely human power of calculating the consequences of the laws of nature.

The only possible escape from this would be to say that the laws of nature are necessary truths, like the laws of numbers or geometry, and so needed no making or enforcing. But every man with what Newton called 'a 'competent faculty of thinking in philosophical matters' knows that they are not, and recognises the truth of Sir John Herschel's remark, in his 'Introduction to 'the Study of Natural Philosophy,' that a sufficiently clever man shut up by himself might reason out all the truths of mathematics in time, but the cleverest man in the world could never find out *a priori* how a lump of sugar would behave when put into a cup of tea. Not only might the law of gravity have been something else, and the intensity of gravity a million times greater or less than it is, but every chemical law of nature might have been different from what it is,

for all that could be determined *a priori* to the contrary. Yet we are asked to believe that the power which made the laws of nature what they are, with their astonishing success in producing and constantly improving the world, had not the infinitely smaller power of foreseeing the consequences, and therefore cannot be said to have designed them. This I have no hesitation in calling absurd and impossible. And if it is, then Paley's arguments about design are right, and would continue right if it were proved beyond all question that every animal in the world is lineally descended from a sponge. In that case he would be proved to have been wrong scientifically as to the *modus operandi* of the designing power, but not the least as to its existence.

Indeed when we have once arrived at the conclusion that the forces of nature cannot go on of themselves, but require a maintaining power, it follows without anything more that that power designed everything; for otherwise we should have the absurdity of a power continually doing what it did not intend, though perfectly capable of altering its course of action, as a power great enough to make the laws of nature obviously must be. The alternative hypothesis, that he might obstinately persist in what he had discovered to be a mistake, is still more absurd.

Adaptation.

It may be as well to notice here a supposed modern refutation of another of Paley's arguments for design,

from the adaptation of various, or (we may say) of all things in nature to each other, and especially of the inferior kinds of things, dead and living, to the superior, and ultimately to us. It is said, of course truly, that we and other animals could not have existed at all unless the world was fitted for us; and therefore it is argued that its fitness for us proves nothing, except that we are a necessary result, and not an object of the laws of nature, for which they were made what they are. But the two things are not at all inconsistent. We may be both a necessary result and also the object of the laws of nature. Indeed we must be both, if the maker of them had the infinitely smaller power of foreseeing their consequences, as I showed just now. And the wonder still remains how any constant laws of nature were invented which would in time produce a world so full of dead and living things so well adapted for each other.

The necessity for adaptation will not produce things adapted for each other. The fact that children cannot live without milk would neither produce milk nor children. The fact that animals cannot live without vegetables would not produce either of them. They are both very complicated machines, and the 'protoplasm,' or most elementary kind of living matter, of which they are all made, is itself pronounced to be a very complicated substance. The result of the laws of nature is that inferior things have somehow been adapted to produce superior ones, if our evolutionists prefer that way of putting it. The world might have

consisted of stones, and they would never have made bread, nor could any living thing have been generated of them—under the present laws of nature. Seeing that the same power, whatever it is, produced the food which is of no more use by itself than stones, and the animals which live upon it, and us who live on them and use them, and they enjoy themselves in their way, and so do we (to put the objects of our life at the lowest), it is not so very illogical to say that, whether we are the consequences or the objects of all this adaptation, the making of laws of nature which have produced it is as strong a proof of design as could well be imagined. And seeing that one of those productions is of a very much higher order than the others, it is not very unreasonable to conclude that the highest was the chief object of the lawmaker who has produced the adaptation and the results by the excellent operation of his laws. I shall also point out presently that adaptation has gone far beyond the mere necessities of existence.

Variety of Nature.

But I want to observe first, that the variety of nature is quite as striking as the uniformity of the laws of nature, or of nature itself within certain limits in each case, and at least as difficult to account for. If any philosopher could have been asked *a priori* whether invariable laws can produce an infinite variety of results he would almost certainly have answered No. But universal experience says Yes. Nobody can find two

leaves of any tree, or any two natural productions of ordinarily visible size which are not visibly different, far more so than any artist could make any great number of them out of his own head. They would soon become intolerably monotonous. I explained before that chance is without meaning under any constant laws of nature (p. 20); and special interference is the last thing that our evolutionists will hear of as an explanation of variety of any kind.

The unknown laws which produce variety may be less simple than the known ones which produce similarity—or they may not. If 'evolution,' or the gradual developement of superior beings from inferior ones, is true in any sense, I mean either automatically or by design, the laws of nature must have been once able to produce greater changes than any that we know by experience; or else there must have been occasional interference. If the creatures that we see now, or their similar ancestors, appeared on the earth suddenly at first, of course that would be the strongest kind of interference with the previous course of nature, and I say nothing about its probability. But if they were developed by successive changes, and ultimately all from one original form or material, we must remember that every such change required a cause, just as much as if an elephant was suddenly produced out of an egg, instead of a crocodile or a chicken. We are constantly reminded that in nature there is no absolutely small or great, and that those words only mean comparison with ourselves or with what we ordinarily see.

Therefore I do not know that it is of any consequence to this argument, whether at some time or other greater changes must have occurred between successive generations than ever occur now, except that a difference in degree is more striking and convincing to some minds than no difference. To some people the birth of a child with six fingers and toes, or a 'calculating boy,' seems to require no cause because it has occasionally happened before; but I suppose few people would think the sudden appearance of an entirely new organ or a new sense, an accident, requiring no special cause or agency to produce it, either by what we should call interference, or by some latent force of nature which had never produced anything like it before. Not only every new organ, but every bone and muscle, and every difference between one vegetable and another, between an oak and a mushroom, began at some time or other as a creation by one of those methods. Nor is it of any theological importance which it was, except that the ordaining of laws of nature capable of producing continual variety and improvement evidently implies more power and wisdom than occasional interference. But it is clearly illogical to deny the possibility of interference merely because we have no evidence of it, which from the nature of the case we could not have, while we assume, i.e. guess at, the existence of intermediate forms of which there is no evidence though there might easily have been plenty.

I will mention a few specimens of the difficulty of accounting for the present state of things without

greater sudden changes at some time than any of which we have experience or evidence, and of the production and maintenance of organs in the face of natural tendencies to destroy them or prevent their growth, and so to bring things back again to the old state, as happens with six-fingered children without any such obstruction to their continuance. What kind of accidental or spontaneous change can be supposed to have made the first electrical battery in the inside of a fish, or the first spider's web, and what were spiders doing before they got that apparatus and knew how to make a perfect web that would catch flies? What made the first caterpillar spin silk, and what particular advantage did he get from it to cause the breed to continue the practice and improve it? Were there ever cats and tigers without their claws with its peculiar hinge, and if so how did they get their living; and did that curious tool first appear by accident? and if it came gradually how was it cultivated while it was of no use? If such features as those could appear at once (and they must be either complete or useless) it is very nearly the same thing as saying that a spider or a tiger or an electrical eel, and all other animals with organs which must be complete to be of any use, were 'created' as they are, whether born of something else or not; for those organs were in fact created whenever they appeared first. It is easy to talk in a general way of small and accidental changes growing into permanent improvements by some kind of 'selection'; but we have seen already that there can be no accidental changes, and it is clear that small ones will not do in many cases.

Again, what kind of accidental small change bored holes in some of our bones for arteries to go through; and made valves in them to let the blood go one way and stop it in the other; and valves the opposite way in the veins; and how did the tendons of muscles hang themselves in pulleys inside the joints, and the pulleys grow in spite of the constant tendency to pull them to pieces? Has anything approaching a rational explanation of the first appearance of a feather in the world ever been invented; or of the first seeing eye; or how bats and birds and insects managed to get wings and fly; or how the animals who wear away their teeth by biting hard substances, such as elephants and rats, came to have them continually renewed, while others, including ourselves, do not, though it would be very pleasant if we had, now that something in our mode of life has made teeth the most perishable of our organs?

It is difficult to imagine two creatures less likely to have got themselves into their present condition automatically than the two which spend their time in boring through the earth. If there is anything unlikely to produce the finest velvet in the world it is the mode of life of a mole, and no covering for such an animal would have been less likely to be anticipated by a philosopher. There is an enormous difference between a mole and a mole-plough in everything but shape. Suppose we had found moles with skin as hard and bright as a lately used mole-plough, our philosophers would have said, 'Why this was just what was sure 'to happen: constant grinding through the earth has

'made this creature what it is: the hardest-skinned 'moles have been the "best," and therefore they have 'survived, and the breed has got harder and harder and 'more polished, while the softer ones were ground away 'by natural selection in the struggle of life.' And very plausible all that would have looked. But behold, instead of having the hardest covering in the world, a mole has the softest. No one who has not felt one has any idea how much softer it feels than any velvet, whichever way you rub it. And moles have persistently gone on growing this soft velvet in spite of the friction which is always wearing it away. What sort of ancestor can our automatic philosophers invent for him, different from himself, and then how do they carry us through the small 'accidental changes' by which he became what he is?*

A worm seems as unlikely as a mole to live by boring through the earth and to 'cast' it up for us, as they do in quantities that look surprising on a lawn when damp nights begin. *A priori* nothing could seem more improbable than that all that work should be done by a creature like a damp and soft bit of string, which

* Killing moles is a piece of vulgar ignorance and laziness, as bad as destroying birds which do more good than harm. They plough the earth and pulverise it, and eat some kinds of vermin. Their hills ought to be scattered, and not the moles killed. We need have no scruples about exterminating directly anti-human pests, from tigers down to fleas. They probably had their use where men have not come, but where they have it is time for our enemies to go, if we can make them. We were to 'replenish the earth and subdue it, and have 'dominion over all the beasts,' but not to destroy them without good reason, as either nuisances or food.

seems hardly able to drag itself along the ground, and much less to bore holes in it.

The horse is a favourite specimen of spontaneous developement with some of our philosophers, and they show us pictures of the very inferior quadruped which they say has gradually improved into our racehorse. For anything I know, or am concerned to argue, that may be a true pedigree. But what possessed those early and unridable *caballi* of fossil ages to have such an eye to business, not their own, but of the coming man, and their own subjugation, as to throw their spontaneous improvements into just the proper direction for our use and admiration? If they had existed in the times when men had learnt to improve breeds, as we have improved the breed of horses, though not to the extent of making any organic changes, it would have been truly said that the alteration from a caballus to a horse was the result of care and design. The thing has been somehow done for us, though the caballi themselves could have no interest in doing it, and now we are told that nobody's care did it, but a series of lucky accidents, of which the animals for some unknown reason always availed themselves, exactly as a breeder would have done, until the inferior race of those who were so perverse as to neglect their own adaptation to our future wants somehow died out and disappeared.

If horses were the only animals so adapted for our use there might be some sense in the remark that it is not so very wonderful that one out of such a multitude

should happen to be useful. But everybody knows that it is not so; and that although mankind could have existed without sheep or oxen, and some nations do, or without dogs and cats, asses and camels, and elephants, eggs and fowls, fish and many fruits, we should be very badly off without them. And to talk of all these, and multitudes of other things, animal vegetable and mineral—and therefore of any of them —being so useful to us by accident, is only another proof of what I said at p. 19, that more persons than have any idea that they are doing so do unconsciously hold the doctrine that the world has made itself by accident, or rather by an infinite succession of the most amazing accidents.

I am assuming throughout, or admitting for the sake of argument, that the theory of evolution by successive small improvements is proved as a matter of mere physical history with sufficient probability to be accepted as a 'working theory,' in the proper sense of that word, though the evidence is so notoriously defective and has such large gaps in it, that the probability is still a long way short of what is requisite before we can conclude anything as to the mode in which those gaps were filled up, if they ever were. What we are inquiring about here however is very different: it is whether any improvement by descent, which means simply the appearance of totally new organs from time to time, can have taken place without creative energy continually going on; whether any descent at all can ever have begun without it, and

ultimately any life at all. The first living thing of any kind, and the first egg or other seed that ever grew, wants accounting for quite as much as the first tiger's claw, or elephant, or man.

The attempt to account for the birth of new organs by calling it analogous to the decay and disappearance of organs that have become useless from some other changes is plainly no explanation at all, even if it were true, which it is not. And yet it is the only explanation which the cleverest physiologists of the automatic development school have invented; and for the origin of life they have invented none. Nothing can show more clearly their consciousness of this difficulty than their desperate attempts to get over it by dogmatically denying that there is any, and denouncing the ignorance of everybody who insists that there is any difference in principle between dying and being born—and born or becoming something altogether new. The author of that 'History of 'Creation' referred to before (whom Professor Huxley complimented by naming after him the slimy stuff called 'Bathybius Haeckelii,' found at the bottom of the sea, which they imagined to be the primary material of life, but later investigators pronounce to be only dead relics mixed with lime) thus professes to dispose of the difficulty of spontaneous birth of new organs:—'Our opponents usually maintain that the 'origin of altogether new parts is completely in-'explicable by the "Theory of descent" (descent ulti-'mately from what?). However, *I distinctly assert*

'that to those who possess a knowledge of comparative 'anatomy and physiology this matter does not present 'the slightest difficulty. Every one who is familiar 'with comparative anatomy and the history of deve- 'lopement will find as little difficulty about the origin 'of *completely new organs* as about the disappearance 'of rudimentary organs. The disappearance of the 'latter, viewed by itself, is the converse of the 'origin of the former. Both processes are particular '*phænomena of differentiation* which, like all others, 'can be explained quite simply and mechanically by 'the action of natural selection in the struggle of 'life,' i. 291.

One naturally expects the quite simple explanation to be coming: but no; that is it, and nothing more, except some pages of declamation about the 'deep 'ignorance' of people who are stupid enough to want any more, and not to see that birth is sufficiently explained by being called the converse of death, and about 'biological phænomena,' 'embryological developements,' 'ontogenesis of single organisms,' and the like; which, if they do not remove any still remaining difficulty in the minds of those stupid people, must at any rate make them thoroughly ashamed of their ignorance, and content to hold their tongues against this new philosophy of effects without causes and laws without a lawgiver. It would be just as rational an explanation of the cause of any particular motion to say, 'motion is 'the converse of rest.'

Not that either death or the decay of unused organs

are purely negative states like rest, which requires neither force nor cause, though they are much more simple processes than birth and growth, even of creatures like their parents, and *a fortiori* of unlike, with any new organs. Death is the cessation of the living forces which prevailed over the ordinary chemical forces for a time. But even that cessation requires a prime cause as much as any other change of motion. The decay of unused organs looks simple at first sight, but not when we consider what it means. Organs that are duly exercised restore their waste by nourishment, and sometimes a little more, so as to increase, while we are young enough; while those that are not exercised and are less wasted for the time, do not quite restore even the natural waste of the body, and so decline. But what philosopher could have divined that that would be so, and that while all dead machines waste away by use, living ones would increase by use and waste by idleness? We know nothing of the prime cause of all this, except that either all the atoms capable of composing living bodies have agreed to do these things also, or else that some constantly acting power and maintainer of the forces of nature makes them so behave.

And yet these are much simpler processes than birth and growth and the developement of new organs and senses, being mere relapses into a more primitive state and reproductions of the very parts wasted. The growth of any thing from any seed or egg or cutting is a continual addition of new particles, all of just the

proper kind and in the proper directions out of the infinite number that are possible. And when a new organ is added, or a part of it, however small, there must be a special cause acting at that moment which never acted so before, or according to Haeckel's phrase 'miraculous,' or 'supernatural,' or contrary to all experience. It need not be what we call interference with existing laws of nature, but it must have been designed somehow to come into action at that moment. If the operation would have been miraculous when performed by a creator, it can be no less miraculous when performed by some energy or potentiality in the atoms which conspired to produce the new organ.

Yet writers of that school talk of animals, and even vegetables, making such and such changes of structure for themselves for certain objects, after their usual device of using figurative language to suggest philosophical conclusions. They know very well that not even the highest animal can make one hair white or black, or add one inch to his stature, by any volition of his own. Such slight changes as we can obtain by breeding or training, or habits of any kind, are not produced by us, but by nature acting as we have learnt by observation that she will if we give her the opportunity: and 'nature' means the power that causes everything in nature.

To talk of 'natural selection' as a cause of the first appearance of any new organ, is an absurdity hardly credible from persons who assume to know more philosophy than the rest of mankind. It has

been remarked over and over again, since that theory of 'selection' was first propounded as an active cause or primary force, and not as a mere natural sequence of events, that new organs cannot be selected and perpetuated before they have been born somehow; and the birth of a new organ or of a new bone is *ipso facto* creation by some power or other. When we want to know what power that must be, it is idle to tell us that in the struggle of life the weakest goes to the wall and dies for want of food, which the better animals with new organs get. The question is how they first acquired the organs which gave them the supremacy; and that question the automatic cosmogonists practically confess that they cannot answer; and yet they go on repeating their phrases about selection and mechanical descent as if they had a real meaning and their emptiness had never been found out.

Beauty.

The beauty of nature is another phænomenon on a very large scale which the deniers of a creator have to account for. And they have attempted it in two or three cases by inventing such theories as that birds and beasts prefer beautiful mates and avoid ugly ones; for which the evidence is very slight indeed, though it is better for the theory that stronger males get the advantage over weaker ones; and that bees and other flower-frequenting insects prefer pretty flowers, and so carry the fertilising material from one such flower to

another rather than to uglier ones. And of that there seems still less evidence, if it can be truly said that there is any. There is evidence that they frequent the flowers which suit them, and that they are guided by the colours and their experience and instinct, and so the colours are kept up and probably improved. But if there were ever so much evidence of it, how came the first coloured flowers and the first honey; and why did those animals and insects prefer the mates and the flowers which we consider beautiful? The great majority of men and women are thought by the more cultivated minority to have generally very bad taste, though that is incapable of demonstration. If birds and beasts and insects have so much better taste as to have produced all that beauty by that kind of natural selection, they have certainly managed better than we do ourselves. For great human beauty is the highest of all, and yet the rarest; though I suppose it is the most valued, desired, and admired of all gifts by the great majority of mankind.

Moreover, we ought to observe that the relations between flowers and insects are maintained by various contrivances which the flowers have executed somehow for themselves. A new one has been pointed out by Sir John Lubbock in a lecture on Ants at the Royal Institution in 1879. Following Darwin, he noticed the importance of flowers being frequented by flying insects for the purpose of 'cross fertilization,' for which creeping insects going only to adjacent plants would be of no use. But ants are fond of

honey, and if they could get into the flowers for it the bees would have no chance against them, for the ants would seize them by the nose and frighten them away. Then how are they to be kept out? Some flowers manage it by growing stems too slippery for the ants to mount. Others grow hairs too sticky for them to pass. But the most common protection is hairs pointing downwards, like the most impassable kind of spikes on a wall. Taking the hint from that, Sir J. Lubbock finds that an artificial wall of that kind, made with fur, is the best fortification he can build to keep his ants at home. On the automatic theory, the flowers must have designed and executed all this for themselves, with full knowledge that they had better cultivate the acquaintance of bees than of ants; and that it would not do to let their hairs grow upwards as everything else does, till it is pulled down by its weight as fruits are. That is a surprising instance of purely vegetable intelligence: for not even the bees could have helped the flowers to grow the proper kind of hairs to keep down ants, though every working bee knows how to solve the mathematical problem of building two stories of cells of just the right size, with the axes of one over the edges of the other, and joined with angles giving the maximum capacity with the minimum of wax. Yet every working bee's parents were not workers, and therefore had no such knowledge to transmit.

How little too of all the beauty of nature do those odd bits of hypothetical explanation serve for. As for

all the rest, if it were in any proper sense accidental and not designed, it follows by the mathematical law of chances that as much of it should be ugly as beautiful. But here comes in another singular fact, that organs which generally remain unseen are more frequently ugly and disgusting than beautiful or pleasant. Nature seems to have wilfully suppressed the beautiful till she came to put the final cover on, except by providing the requisite structure for it, or where the thing was intended to be cut for use, like some which I shall notice presently. The most beautiful human body, or any other, without the skin, is very ugly, except in its general form, which is of course the same. The skeleton is still uglier, and all the internal organs are something more than ugly, besides being unsymmetrical or lop-sided; and yet they have learnt to pack themselves together so as to leave the trunk symmetrical or alike on both sides, though our right limbs are stronger than the left. The veins and creases on anybody's two hands are unsymmetrical, and the colouring on many beasts; but the former is immaterial, and the latter always increases their beauty, though any difference of colouring on the two sides of a human face is ugly. All trees are beautiful, but never symmetrical, which all beasts are in shape.

But not quite all things that are generally visible and finished by nature are thought beautiful by anybody. If they were there might be some foundation for the assertion that beauty is only a matter of association. Sandy plains and great swamps are common

enough, yet nobody admires them. The same is true of a few common vegetables, such as the nasty-looking fungi. And though the vast majority of natural smells, of things growing, and even of the earth itself, are pleasant, a few are disagreeable, including some pretty flowers, such as poppies, and all things in a state of putrefaction; which warns us to remove them into the earth, which soon converts their stink into sweetness, if it is plentiful enough. Is that also automatic or accidental? Mankind has enjoyed a long and pleasing familiarity with oysters: indeed heaps of oyster-shells are the oldest relics of human food in what are called pre-historic times. Yet they are about the only shells that cannot be said to have external beauty, while the infinitely rarer pearls which sometimes come out of them are highly prized. Many very rare things are still more beautiful: diamonds especially, as soon as they are cut properly. For they, and sundry other objects of universal admiration, and therefore of absolute beauty, require artificial treatment to bring it out, such as marble and the fine-grained woods, which have no beauty till they are polished; and yet the polishing does not make the beauty, as painting might, but only reveals it. Every now and then a new shell is discovered and is admired at once, and therefore its beauty must be absolute, or have no relation to association or habit. And had the little creatures who make shells and corals an eye to beauty too, as well as the bees, who have never managed to impart any beautiful colours yet to their favourite mignonette and flowers

of the lime-tree? Nearly all animals are handsome both in form and colour; but the ugliest are among the commonest, viz. some kinds of dogs and all kinds of apes, and they both happen to be the nearest also to ourselves in intelligence, and the apes in form; and we may say the same of the intelligence of elephants, who can hardly be called beautiful. On the other hand, snakes are almost universally abhorred in spite both of their beauty and their commonness in some countries, while more noxious and rare tigers are among the most beautiful of beasts.

That explanation therefore will not do, even for animals capable of 'natural selection' and 'survival of 'the best,' and all those other operations, which are first imagined to do all these things, and then treated as if they were active powers and not mere results of the very laws and forces of nature which we are trying to account for. And if they were all that is assumed, how did the 'potency of matter' or the universal suffrage of the atoms of the universe go to work to make nearly all the face of nature beautiful or magnificent, with just enough exceptions to refute that theory of beauty being only association? What kind of spontaneous action made the beauty of hills and valleys, of forests and all trees, of water in all its forms, still lakes and running streams, waves of the sea and waterfalls, clouds and snow and ice, dew on the grass, and frost on glass, which sometimes freezes the damp inside a large window into the most beautiful vegetable forms; of sunrise and sunset, and the sky full of stars,

of the rainbow and the northern lights, probably the most beautiful of all natural phænomena, the colours of polarised light and iridescent films, of marble and wood and precious stones, and of all natural colours or the means of making them; of electrical discharges through a vacuum and certain gases, of all kinds of fire, the noise of thunder, the smell of most herbs, and of the earth when ploughed up, as if to compensate for its roughness? No theory of the universe that will not account for these results is worth serious consideration against the one that will, viz. the theory that they were intended and designed by the power that made the laws of nature, and who may reasonably be assumed to prefer beauty to ugliness, and certainly knew how to produce it, which we do not, or very little.

For it is remarkable how incompetent we are to invent beauty, even to please ourselves, though we can recognise it when we see it. The only really beautiful things, which are not more or less copies of nature, that mankind has ever invented, except small ornaments not comparable to nature, are some buildings during a few centuries of a few nations; and that art is all but extinct. It has often been observed that, not only that art, but even the art of combining natural colours beautifully declines instead of advancing with civilization. But no one will contend that the best work of that kind that was ever done is comparable in beauty to innumerable combinations produced by nature. We can indeed to a certain extent

persuade nature to improve herself by what we call breeding; but that is nature's doing and not ours. Let the best artist in the world try to make a picture or an image of some new animal or vegetable out of his own head, as they occasionally do from ignorance or carelessness in copying, and it is sure to be a monster, which anatomists denounce as physiologically impossible, and very inferior in beauty to most real animals. How few can make even a decently correct copy of natural objects, and they always deviate from the normal form for the worse in point of beauty. If the 'highest intelligence' of the atheists can produce so little of either beauty or variety when it tries its best, we can hardly be expected to believe that the lower intelligences, or none at all, have produced their own beauty and variety by either careful selection or by lucky accidents, luckily repeated an infinite number of times.

The evolutionists never seem to take account of the necessity for such fortunate repetition. The chances are prodigious against the accidental coming together of any two creatures born with the accidental improvements which are assumed to come spontaneously now and then, so as to produce any more. And without such concurrence frequently repeated the accidental improvement of a few individuals would be of no use; for they would die out in very few generations.

Dr. Mozley in his sermon on Nature remarked further, that 'it is beautiful by the self-same materials 'and laws that it is useful: the beauty of nature is not, 'as it were, a fortunate accident . . . it is just as much

'a part of nature as the use. Take a gorgeous sunset: 'what is the substance of it? Only a combination of 'atmospheric laws of light and heat; the same laws by 'which we are enabled to live and see and breathe.' And again—'Who could have told beforehand that those physical laws, which fed us, clothed us, gave us 'breath and motion, the use of our organs, and all the 'means of life, would also create a picture? These 'two results are divided *toto cœlo* from each other. 'Those laws go on employing themselves on plain hard 'work, till we become suddenly alive to their throwing 'off, in this working, a magnificent spectacle, as if by 'some happy luck.'*

The same is true of the smaller organized objects, even of the most simple kind compared with the more complicated organs such as eyes and hands. Suppose that same 'highest intelligence' had been set to invent an apparatus for itself to bite and grind its food and help its voice; even if we had the least idea how to set about the latter business, until quite recently perhaps: does anybody imagine that we should have produced anything more beautiful than the multitude of ugly grinding machines with horrible noises that we have made for thousands of years? Yet some other intelligence has made a mouthful of good teeth so beautiful that we cannot look at it without admiration, though we cannot say that a line in it is

* I would refer to the whole of that sermon, and to the essays on 'Design in Nature,' and 'God Exists,' in the Archbishop of York's 'Word, Work, and Will.' Why has not natural selection made female birds as beautiful as male, as it has among mankind?

put there for ornament. Eyes are still more wonderful in that way, and in every way. Eyebrows and eyelashes are for use, and consist only of a few short hairs, and yet are proverbial objects of admiration.

If we had never seen a head of hair, and were told that covering a head with innumerable strings of uniform colour would convert such a plain object into a beautiful one, and that those monotonous-looking strings would be cherished as an ornament of the utmost value, nobody would believe it. Yet we are expected to believe that at some time or other some animals began to invent a little hair for themselves, or that some came by 'accident,' and they admired it so much that they took to propagating it by 'natural selection'; and so some animals became regularly hairy—and others did not; and some that had become so afterwards changed their minds and gave it up. This kind of guessing at the origin of things for the purpose of avoiding any creation or design is only substituting something else which was just as much creation as the sudden appearance of an elephant or a man where there was nothing like one before. And even that is infinitely more probable than that, without any designing power anywhere, atoms of matter should have learned of themselves, as gradually as any atheist likes, to combine into elephants and men, and to propagate young ones; which is the real meaning of spontaneous developement on Haeckel's co-operation theory, or any other.

If it be said that a great deal of the beauty of the

world is wasted because it is never seen by any eyes which can appretiate it, that is an assumption that cannot be proved; and independently of that, it is no argument against design. Some members of every such class have been seen, or it could not be known that they are beautiful; and the class must be governed by general laws. All things, if designed at all, must have been designed to be either beautiful or ugly, and beauty is a kind of perfection. How can anybody know that the power which designed them is incapable of being pleased with beauty or perfection, though for reasons that we do not know in all cases (though in some we do) he has left a few things ugly or unpleasant? This question also may be tried by the necessary alternative. Suppose the proportions of beautiful and ugly, of nice and nasty things of all kinds, had been reversed, the deniers of design would have said, 'A 'power capable of designing the world would at any 'rate have made it better than this; with our necessary 'food nastier than medicine; with most of our grasses 'and flowers stinking and ugly; with hardly an animal 'that is not disagreeable to look at; with nearly all in-'animate objects as frightful as the dreariest swamp or 'desert is now; with even the faces and forms of men 'and women as ugly as skeletons or skinless bodies.' And a very strong argument against design it would have been, if no Moses could have written, without the sense of mankind contradicting him, 'God saw every-'thing that he had made and behold it was very good.' The converse argument is equally strong, that the enor-

mous preponderance of pleasant over unpleasant things, and generally of good over evil, and the tendency of that preponderance to increase, indicates a design, and cannot otherwise be accounted for.

The inventors of phrases which imply arguments dexterously call the imputation to a creator of pleasure in his own works, and indeed of design generally, or anything implying mental operations like our own, by the formidable name of 'anthropomorphism'; which they conclude will be quite enough to frighten those who know nothing about it, and those who just know that its proper meaning is the imputation of the *form* of man to God. But that is only another verbal artifice. We impute no human form to God by using the only language that we can to express that he did what has been done by whatever power made the laws of nature, and that he preferred doing it well to doing it ill: the contrary of which is absurd. Such artifices as these are only a mode of preaching atheism under false pretences of humility, like talking of the 'impos-'sibility of knowing the unknowable,' 'comprehend-'ing the incomprehensible,' and a number of similar phrases, which invite people to surrender their common sense to mere verbal conjuring. It does not follow that because we cannot know or comprehend all about a creator, we cannot know what is evident from reasoning, or comprehend what we have reason to believe that he has told us. Atheists certainly cannot prove that he has not, though they do not believe it themselves; and in an argument about comprehending it

they have manifestly no right to assume that there is nothing to comprehend.*

Although no living thing could exist if the world and food were not adapted for it, and in that sense they may all be considered consequences of the condition of the world, that (as I said before) would not produce either, and does not prove that they were not the objects for which the laws of nature were designed. Still less would the necessity for sufficient food provide so much that is superfluous but pleasant, or even make all things that are fit to eat also good to eat. Hunger would

* Of course arguments which assume that God has told us anything are of no use with unbelievers, and this note is not meant for them. But it is an appropriate occasion to suggest to others that the saying, 'Let us make man in our image, after our likeness,' and 'In the 'image of God made he man,' which was repeated again after the flood as a perpetual reason for punishing murder with death, has a more real and literal meaning than is generally attributed to it. Moses could never have invented it; for it looks most improbable and incomprehensible on the face of it, especially in contrast to Exod. xxxiii. 20. But the evolutionists believe no less than we do that man is the climax or highest developement of nature. The human form then existed in the mind of the Creator from the beginning, and was (according to the Bible history) the form which he intended for his own whenever he should appear to men; as he evidently did, and perhaps frequently, in the early days of mankind, long before Moses wrote those words, and as late as Abraham and Jacob (Gen. xviii., and xxxii. 24), to say nothing of the greater manifestation afterwards which we believe in. If it ever was true, it had ceased to be true long before Noah's time, that man is made in the *moral* image of God, which most if not all commentators take those words to mean; and it was a most unnatural and unlikely way of expressing that meaning if it was intended: whereas the other was quite natural if the history is true. We, at any rate, need not be disturbed by the charge of anthropomorphism for speaking of God's feelings and intentions as the Bible does continually; in fact the word has no right to be used at all in that way.

make us eat bad bread, and meat that gives no pleasure, if we could get no better. Here again it will not do to say that habit makes us like our food when it is of customary goodness. Many rare or costly fruits, of which nobody eats much, and many generations and many individuals none, except on the rarest occasions, are immediately thought very good. Why should not grapes and oranges and peaches and pine-apples and the modern vegetable rhubarb be as nasty as castor-oil or 'rhubarb and magnesia'? And how did European mankind come to learn so late that tea and coffee and cooked potatoes are so good? The credulity that can believe that these things also came of themselves without design anywhere, might as well be employed in believing in Jupiter or Juggernaut.

These, and all that I have mentioned, are not a few obscure and minute phænomena, which a new theory might be pardoned for not explaining all at once, but they are the largest and commonest phænomena in the world, which a theory is bound to account for rationally before it has the smallest claim to be received even provisionally as a 'working theory,' only waiting for confirmation by some hoped-for discovery. No possible discovery can ever help the theory of effects, and such effects, without any prime and continual cause of every motion. It is more irrational than the cosmogonies of the antient pagans and of some modern savages, which all recognize some kind of designing power. The argument from adaptation and design, which it is the fashion to call 'teleological,'

may have been weighted by injudicious advocates with more than it can logically carry, and it will from time to time want adapting to fresh discoveries, as it has since the days of Butler, Paley,* and the Bridgwater Treatises; but substantially it remains and always will remain the same, viz. infinitely the most probable solution of the problem of the universe, and therefore the only rational one.

'Simplicity of Nature.'

'The simplicity of nature' is a favourite phrase with some people, as if it helped to explain the origin of 'nature,' which is only the short name for the actual condition of all things. It would be difficult to use a phrase more inaccurate. Each law of nature is simple enough by itself, being merely the statement of a single uniform course of action in one kind of circumstances. And each natural contrivance by itself is probably the simplest that would answer all the purposes. But when we look at the elaboration of details expended on every natural construction, we find it unlimited in complication. We build houses and machines of bricks or stones or pieces of wood and metal, and those are our ultimate particles for these purposes. We paint a picture of a definite number of dabs of paint, not very small, and it is an approximate and coarse likeness of nature at the best, and the more we magnify it the coarser and worse-finished it looks. Watches have been

* The new S. P. C. K. edition of Paley's 'Natural Theology' is so adapted.

made containing from 50 to 100 pieces in the compass of a shilling, and are thought a prodigy. Turn a microscope on to one of them, and it looks coarser than a common mangle. Turn it on to a bit of any organized compound, and you can see no limit to the subdivision and the careful arrangement of the particles. It may be that if we could carry the dividing power down to the 500,000,000th of an inch in diameter we should reach molecules or atoms bearing the same relation to the work of nature as bricks do to a house; except that the bricks are all alike, and the atoms are not. But our microscopes are a very long way from that, and nobody is sure that even then we should reach indivisible atoms, or that there are such things. They are only the name that is used for the smallest particles of which we have any knowledge by scientific inferences.

We take pieces of glass of different kinds and grind them to particular shapes and set them in a frame and make a telescope, which refracts rays of light so as to produce an 'image' of a very distant object near our eye, and that appears much larger when seen through another glass of proper shape. But we have never yet been able to make one that can bring all the rays from a single distant point exactly to another point, without confusion. Yet there are many millions of apparently self-made machines in the world that do it perfectly; and when we cut up one of them and examine it we find that instead of our large lumps of glass melted together into a coarse kind of uniformity, this machine has been built up of an innumerable quantity of

particles arranged in peculiar and complicated ways, some of which have objects that we understand, though we cannot imitate them, and others that we do not. Moreover they are persistently alike in every machine of the same class, and again some of them persistently unlike those belonging to any other class of animals. For a long time the retina of the eye used to be called a membrane, or a kind of thin sheet. Then it was found to be a kind of brush of which the hairs vibrate under the vibration of the rays of light; and now these hairs are found by further magnification to be divided into so many parts lengthwise that a picture of them has to be as long as the picture of a striped or spotted animal to distinguish them; and instead of being simply set fast by one end like hairs in a brush, they pass through several frames or membranes; and of the use of all these pieces we know nothing. Such is the 'simplicity of nature' in that organ which next to a stomach is the commonest in all living creatures; and such is our ignorance of nature yet.

Notwithstanding all this, the automatic evolutionists tell us that eyes were never designed to see, nor ears to hear, nor hands to handle, nor noses to smell, nor stomachs to digest, but they came to do all these things of themselves; and they pretend to prove this by saying that they find some rudiments of eyes which could not see, and so on, in more rudimentary creatures, and that these organs have only acquired their astonishing complication and their corresponding faculties by gradual and spontaneous improvements.

I do not know whether that statement is accepted by other physiologists, as to the mere physical history; and it is never safe to accept statements of doubtful facts on the sole authority of persons with a theory to support. But however their theory may be affected in other respects by this supposed or real discovery of non-seeing eyes and ears not made to hear, it is not of the smallest consequence to the present question: if anything, it tells against their view of the origin of nature. For, if true, it means that some power or force, or series of lucky accidents, was going on for ages secretly building up an eye or any other organ without any kind of use until it should be completed, as a man building up a complicated new machine, for which he intends to have a patent, thinks it prudent to conceal the object, and therefore some essential parts of it, as long as possible from his workmen. Only this eye-compiling process took an immeasurably longer time, according to the views of the evolutionists, and the complication is infinitely greater, and the elements of the machine infinitely smaller and more numerous than of any human one, and the work at last infinitely better, though the man knows what he is about and the rudimentary eye or its proprietor did not. And all this did itself without design anywhere, either in the atoms of matter or in any power outside them. This long and secret process of automatic organ-building, without any discoverable object till it was finished, or any conceivable reason why such useless and imperfect organs should be carried on by 'natural selec-

'tion' or any thing else, and still more why they should spontaneously improve instead of dying out through having nothing to do, is certainly not less absurd or improbable than that they should have come into being at once, capable of doing their work, as it is admitted and is evident that completely new organs must have done sometimes.

Human Peculiarities.

Though we are not considering the origin of man specifically, but of all nature, which includes him, it is important to remark that his specific qualities are still more inexplicable by any atheistic theory than those which are common to him and other animals. However difficult it may be to define beyond dispute the physical differences between them, his superiority as a whole is more evident and indisputable than the best philosophical definition could make it. And it is equally indisputable whether we believe or disbelieve such statements as that 'there is less physical difference between man and certain apes than there is 'between the most different kinds of apes:' not that any one ape is agreed on as being altogether the nearest to us, some being more human in one respect and some in another. The attempts to represent the cleverness and the co-operation of some animals as only differing in degree from ours leave our general superiority equally untouched.

No extension of the simial family ever so far down-

wards, nor any difference between the highest and the lowest branches of it, will do anything towards filling up the gap above, between the highest apes and the lowest men; whose brain, Lyell says in his 'Origin of 'Man,' weighs three times as much as any ape's, while the highest and lowest human brains only differ by a small fraction. And that is the rudest and most external view of the difference: for it is certain that there is something in the quality of brains as well as in their size (though no leader of mankind ever had a small one); and no philosopher has ever suggested that the quality of any ape's brain is superior to any man's; nor indeed is the intelligence of apes the highest among beasts.

Not only have no intermediate terms* been found in the imaginary series between them and us, but every fresh discovery which the evolutionists adduce to carry the antiquity of man further back is a fresh argument against his simial origin, since no trace has been found of any prehistoric men more like apes than we are, or with smaller brains than we have now. It has also been remarked as an awkward fact for the theory of man's simial descent that he would not be an advance by natural selection or survival of the strongest, but a degeneration from apes in nearly all physical powers except manual dexterity; and that the first children of apes that displayed human infirmities would have had no chance of living.

* I do not use the common phrase of 'links in a chain,' because links are all alike, but terms in a series increase according to some law.

The evolutionists have accordingly invented a new hypothesis of late, that we are not descended from apes after all, but from some quite different but unknown common ancestor, in different lines, the apes having advanced in physical powers generally, and man in intellectual, moral, linguistic and manual.

But considering the confidence and contempt for all doubters with which the direct simial descent was affirmed till this new theory was invented, we may be pardoned for receiving that with equal doubt until nature is kind enough to furnish something fit to be called evidence to support it. And this change of theory immensely increases the difficulty of finding the requisite evidence. While we were lineally descended from apes there was only one pedigree to trace, and the discovery of a very few intermediate types would have been considered ample evidence of the pedigree. But if the apes are not to be our ancestors but only our cousins, and obviously, on this theory, many times removed, there are two long pedigrees to trace in different lines up to ancestors entirely unknown, and therefore two sets of missing terms to be found, ending nobody knows where, before the new theory can be said to be supported by any evidence except the bare likeness between men and apes with which it starts—and ends as yet.

And if any such intervening terms in the two unknown pedigrees should hereafter be found, the same question will still have to be asked for every change, What caused it? Take only one of a number which

have been often noticed, that which was poetically described by Ovid thus—

> 'Os homini sublime dedit, cœlumque tueri
> Jussit, et erectos ad sidera tollere vultus;'

or in more prosaic language, how did man alone of all animals come always to carry his body erect instead of horizontal; or to be the only animal that kicks forward, or strikes with doubled fist; which has also strangely gone along with the most delicate hand in all creation? Such changes as these are equivalent to creation, by whatever other name they may be disguised. They are greater than the addition of more vertebræ to the neck of a giraffe or the body of a snake, or of a tiger's claw, or any of the completely new organs, bones, sinews or tissues which even such writers as Haeckel admit must have come from time to time, and which were every one creations by some means or other, whenever they did first appear.

But all these physical differences, and any others, are as nothing compared with the non-physical differences between men and beasts. The old idea of their doing everything by instinct and nothing by reason is indeed exploded and manifestly wrong. But instinct is not exploded. And there remains the striking distinction that beasts have instinctive or innate knowledge enough for all their own purposes, though they may learn a little more, and that we have not. The proverbial wisdom and co-operation of bees * and ants are innate and want no teaching. Birds of the first

* See p. 90.

year build as good nests as if they had been building fifty years. All animals know what food to eat, and how to get it if it is to be got, and very seldom poison themselves. We have no innate knowledge, but an unlimited capacity for learning by experience and teaching, either human or divine. Man can do scarcely any thing by instinct, beyond feeding himself with milk at first, and afterwards with fruits. But he does not know how to make them grow, or to distinguish poisonous from good ones, or to cook either vegetables or flesh, which are not fit to eat raw; nor even how to make a fire. The few 'wild boys' that have been found in woods seem to have had no knowledge of that kind, though they had faculties for gradually learning. Many dogs have what may be called an instinctive polarity, which enables them to find their way home by unknown roads, or over which they have been taken in carriages, and even over the sea. Men have no such faculty. Nor can we with all the appliances of art make as good a nest as any bird, or a honeycomb and fill it with honey got from flowers. Much less can we compound milk, or make silk or anything as fine as cobwebs; but these are animal products and not merely animal manufactures.

But we can acquire and accumulate and transmit knowledge without limit. We can cultivate the ground and make it produce food of all kinds fit for us, and cook it, and make tools, and invent watches and steam-engines and telegraphs and telescopes, and measure the distances and sizes and weights of the sun

and planets, and discover what the stars are made of, and their motions, and predict nearly all the regular celestial phænomena, though not the weather, except for a few hours to come; and resolve visible and invisible matter into its elements, and investigate the history of the earth and the laws of nature, and go on finding out more and more of what some creative power has been doing all along,—and then deny that there is any, or that if there is it knew what it was doing or had any design in doing it;—or perhaps we can refute such denials. We have dominion over all the world: we can form abstract ideas and perform abstruse calculations, and use many languages and write them, and so preserve our knowledge for our posterity to increase; which without language is impossible. We can influence mankind by reasoning and eloquence, and delight them by music and the other arts.

Besides all these powers of dealing with sensible realities man alone has convictions, right or wrong, about the insensible, and theories of moral philosophy. He has either invented or has had revealed to him the existence of an invisible power infinitely superior to himself; and the highest races of men have the strongest convictions of that kind. Somehow or other a tendency to what is shortly called religion has come into the human mind everywhere, except among the lowest savages. A great deal of it must indeed be false, because it is various and contradictory; but that may easily be because the original communication of what was true has been corrupted, either through care-

lessness or fraud. And we are not now upon the truth of any particular religion, but on the distinction between man and beasts in having any. Attempts to explain it away by saying that dogs have a kind of religion, and that 'Man is the God of dogs,' are only another piece of verbal conjuring. The 'religion' of dogs consists in their worshipping (if you like to call it so) a visible and superior being whose power they see and feel daily. Human religion means worshipping an invisible power which men have either imagined by some innate faculty of their minds, or else who has given such proofs of his existence and his will as satisfy their reason.

It is equally absurd to talk of brutes conversing because some of them can make noises more or less intelligible to their own kind for a very few purposes. That is no more conversation than music is with us, and they can invent no new noises. Even birds that learn to imitate words and occasionally use them as they hear us do, and dogs that learn their letters on cards and can follow spelling, and those that understand some things that we say, even when not intended by us, use none of these faculties for their own ordinary purposes, and much less for preserving or imparting knowledge. All such capacities soon die out and vanish if they are not kept up by teaching and practice in each successive generation. They never become natural, as our capacities are, however much they are neglected. Geniuses, or persons with abnormal capacities for intellectual achievements of

various kinds, sometimes, and indeed more frequently than otherwise, appear suddenly from parents who had nothing of the kind: which is unlike any thing that happens among brutes. Though 'heredity' in a certain sense accounts for similarities, something else is wanted to account for the occasional great superiority of children to their parents.

If an animal were found to-morrow somewhere in the world as like to man in all physical qualities as negroes or Chinese are to Europeans, but with no more than a beast's intellect, morals, capacity for investigating the laws of nature, for accumulating and transmitting knowledge, for conversing, for forming and expressing abstract ideas and calculations, with no religious tendency or capacity, which has no 'dominion over every other 'living thing that moveth upon the earth,' has no tool-making or cooking power, cannot learn to make a fire, nor cultivate the ground— such an animal would still be a beast and not a man: no theory of evolution, if every stage of the process stared us in the face, between that animal and the dust of the earth or the Bathybian slime, would help us a step over the gulf between that beast and man. We may perhaps never be able to discover how that gulf was passed: whether the creature that was made a man by having all these human powers given to it was physically the offspring of a beast, or an original creation. The giving of them was equally a creation either way, 'miraculous' or 'super-'natural,' or contrary to the previous course of nature. In either case the atheists have to ask us to believe

that dust and gases spontaneously agreed to invent all these spiritual or metaphysical qualities, besides the new physical ones, and to endow a new creature with them, whether suddenly or gradually makes no difference; and we are to accept this outrageous hypothesis without a scrap of evidence, as more credible than that all this was done by a creator who indisputably could do it if he exists; and nobody pretends to be able to prove that he does not.

Evil.

But atheists say that the existence of a Creator is incredible, because he must then have designed and must intentionally maintain all that is evil as well as all that is good in the world: which they then pronounce incredible. Moral evil it is notoriously useless to dispute about with people who deny free will and say that all our will is a mere physical result of motions of the brain, which again are due to physical causes only. When they can prove that, with the same degree of certainty which every man feels that he can put which leg he chooses foremost, or turn his thoughts which way he pleases, within certain limits, that question may be worth discussing with them. For the present I shall speak of physical evils or defects only. And though these cannot all be accounted for as yet, by reason of our ignorance, it is certain that no atheistic theory can account for the immense preponderance of good, as I observed just now on some

special instances of it. So here again on the balance of necessary alternatives atheism has the worst of it. But some better explanation can be given now than in old times, of the permission of physical evils by a creator whose object is the greatest good, and who works by constant laws. I have several times said that no omnipotence is conceivable that could prevent the mathematical or necessary consequences of any law of nature, so long as that law is maintained. If the known law of gravity was to be selected as the best possible for the universe, the planets could not help moving in one of the curves called conic sections if they were to have any orbits, nor in that particular one called an ellipse if they were to have returning or 'closed' orbits, i.e. to be companions of the sun and not to run away into infinity. Those results could not be altered by any conceivable omnipotence except by constant interference with his own laws.

The planets then, and all upon them, must take all the consequences, good and evil, of having to move in the only possible orbits under the best possible laws of gravity and motion. And everything else must take all the necessary consequences of the laws of nature which have been ordained as the best for the present, though some of the consequences are unpleasant. Extremes of heat and cold, storms and floods and earthquakes, epidemic plagues and most diseases, 'accidental' deaths, and every kind of physical calamity, are necessary results of the best possible laws of nature (as we are justified in calling them by

their general success and our inability to invent any better) together with the frequent addition of our own wilfulness and folly. So long as the Creator was considered an arbitrary power, not acting according to uniform laws, but carrying on the universe by a system of constant interferences, it was difficult to make out that he was not to be regarded as the intentional author of all the evil that exists, for no reason except that it may be for some final good of which we are ignorant. And so it very likely is, although we cannot prove it and do not assume it here. But when the evil is a necessary consequence of constant laws of action which are on the whole the best, the intention is perceived to be very different, though it is still intention, being just as much a foreseen consequence as the greater good for which the law was made.

Of course we who believe that the Creator will one day make a perfect world believe that he could have done so now. But it must have had some very different laws of nature from the present, with which decay and death—unquestionable evils, and worse on the atheistic theory than ours — are inextricably connected. Believers in a continual advance to perfection by the spontaneous co-operation of atoms have to explain, first, how perfection is ever to be reached in the face of the difficulty just now stated; and secondly, why it is more incredible that the scheme of a world advancing to perfection should have been devised and carried on by a creator who manifestly can accomplish it than by some immutable forces

which manifestly never can. On the other hand, those materialists who only hold that the world will go on improving up to some unknown point a good deal short of perfection, until it dies of cold like the moon, or is conflagrated like some of the stars which we have seen for a short time on fire, have to explain why it should improve at all, or ever has improved out of chaos or a melted mass into its present vast preponderance of good. According to the well-known laws of chance any self-existing forces, with no preference of their own for good over evil, must have produced as much of one as the other on the whole. Any deviation from that result must have a special cause; and the greater and more constant and increasing the deviation in favour of improvement is, the more active and continual that special cause must be. The materialists are utterly and avowedly without one. As for dogmatically pronouncing that a perfect Creator would be sure not to begin with an imperfect world, that is a mere guess not worth attending to. Nobody can possibly know what a creator would do except by seeing what has been done, and that justifies no such conclusion certainly. Guesses at what 'nature' would do in common physical matters generally turn out wrong when the light of real discovery is thrown upon them. I do not mean scientific inferences from known facts, such as Newton's that diamonds would burn though he had not the means of doing it, but mere guesses not founded on experience, like this assumption of what a Creator would be likely to do, and the

consequent dogmatic declaration that he does not exist because he has not done it.

So far as physical evil is due to the folly or the wickedness of men, as a great deal of it of course is, the atheistic theory is again deficient, and much the most improbable, because it not only does not provide but denies the only possible recompense for unsuccessful virtue and successful vice, and leaves many of the best people and benefactors to mankind 'of all men most 'miserable if in this life only they have hope,' and many who are no better than curses to the world prosperous and joyful to the end, if they are only prudent enough to avoid human punishment and diseases of their own causing, and are entirely free from fear that they may after all have been calculating wrongly about the future. I do not know whether atheistic philosophers believe that virtuous men are generally happier than prudent vicious ones, or only about the same on the average, and therefore I must consider both alternatives for a moment. If they are happier, then they are so by reason of some laws of nature. And how came any self-existing forces of nature, or determinations of the atoms of the universe, to produce such a remarkable moral result as that of happiness in spite of all the adversity and suffering to which good people have always been as liable as bad ones, and in some periods much more liable? That problem is not the easiest which atheists have to solve. If on the other hand they say that happiness is pretty equally distributed between the good and bad, now and for ever, the

former answer comes in, that that is a much more unreasonable theory than ours, which believes that that great unfairness will be finally adjusted, and that it is so even now invisibly to a great extent by feelings and hopes which atheists ignore.

Probably they will reply that such terms as 'unreasonable or unfair' are inapplicable to results of mere physical laws of nature; and that we might as well talk of the unfairness of an earthquake or a shipwreck, which 'fall alike on the just and on the unjust.' That runs more into direct theology than I mean to do in this treatise. I am not arguing the doctrine of a future life, but only answering the objection that a creator and maintainer of the world who permits and therefore causes evil is incredible. We agree with them that one who does so without intending to rectify or adjust it hereafter is incredible. But they must take our theory as it is, and not split it in two and then say that one half is incredible alone. For although they do not believe the other, viz. the future retribution, it is quite certain that they cannot disprove it either by any *a priori* reasoning or any that is deducible from nature and experience. The pretension of some scientific men to set up for authorities on that subject only deserves the ridicule which they bestow so freely on those who differ from them, and some of whom know vastly more than they do of the only kind of evidence and reasoning that is applicable to such questions. Our theory as a whole is far more credible than theirs as an explanation of the evil

in the world with the immense preponderance of good, which theirs is utterly unable to account for in any intelligible way; for the only intelligible one would be that which is too absurd to be seriously propounded, that the atoms of matter, from 'the beginning,' or whenever they adopted their innumerable laws of motion by universal suffrage, had an eye to the ultimate preponderance of good over evil, and the advantages of virtue to the coming race of men—coming millions of years afterwards.

Summary.

But all that has little bearing on the origin of the laws of nature though it was necessary to touch upon it so far. What I have professed to show is that the choice of that origin lies between only two possible or conceivable alternatives, into which all others resolve themselves, however they may be disguised by fine language on either side; viz. one creator and maintainer of all the forces or laws of nature, who cannot but possess the infinitely smaller power of foreseeing their consequences, and therefore *ipso facto* intended or designed them; or else, as many self-existing powers as there are atoms in the universe, which must have automatically co-operated (as the materialistic philosophers say themselves) and each chosen its own courses of action with reference to every other atom and all their possible combinations in all possible

states, and must have resolved and continually resolve always to adhere to them.

It ought never to be forgotten that this is the only real meaning of such phrases as 'inherent forces' or 'properties,' 'potencies of life,' 'self-existing laws,' 'self-contained energy,' or any others of that kind. Otherwise they mean absolutely nothing in the way of explanation, but merely assert that the forces or tendencies or usual behaviour of the atoms of matter do exist, which everybody knows just as well as those philosophers, but of which they profess to be investigating the prime cause, and to have some information to communicate to mankind about it, either in the way of scientific discovery or reasoning upon what is already known. Applying learned-looking phrases to known facts is communicating no information, and is a mere false pretence of adding to the knowledge of mankind; and it is also a practical confession that no reason can be invented for rejecting the undeniably adequate explanation given by another theory.

We saw also that, according to the received theory of the gradual dissipation of energy, or the inevitable final equalisation of heat over the universe, or even without that theory, the laws of nature cannot possibly have lasted from eternity without some interference. Therefore the present laws and forces must have begun to act at some epoch; and as they clearly could not start themselves without a will and power somewhere, either in every atom or outside them, but present with them all, that will and power or that

infinite number of powers must have existed from eternity; for a self-existing power clearly could not begin to exist at any time, though it could begin to act at any time; nor could any once self-existing power cease. And the power that has been great enough to produce everything that exists is properly called omnipotent.

I further showed that no action of a mere prime cause once for all could produce any constantly existing forces, acting or ready to act at any moment, which every force in nature is. For by Newton's universally received 'axioms or laws of motion' (p. 43) every motion that exists, and every attraction or tendency to motion, requires a force impressed at every moment, and therefore the action of some will and power to impress it. And I pointed out the fallacy of the proposition that the constancy of the laws of nature proves or raises the smallest presumption that they are not maintained by the constant will and action of the power that ordained them; for their success in keeping the world going, and in some respects improving, only proves the excellence of the design which has never wanted mending by interference.

I showed also that design of all the actual results was *ipso facto* involved in the making of the laws of nature, unless we adopt the absurd hypothesis that a power great enough to make them, and such good ones, did not possess the infinitely smaller capacity to foresee their consequences, or the still more absurd idea that he goes on maintaining them after finding by expe-

rience that they might be mended, as we do with all our contrivances and laws.

The variety and complexity and beauty of nature are not pretended to be explained by any automatic or atheistic theory, except in such small and doubtful instances as are only worth noticing for their fewness and inadequacy to support any theory. The confessed or demonstrated failure of the attempts to prove that life ever originates itself, is evidently fatal to the doctrine of 'matter containing the potency of life.' Generation of one life from another is equally unexplained as an automatic process. Calling it natural or mechanical is only a confession that no cause can be assigned for it, except the constant action of some power to work the machine or to keep the process going. And if the generation of like from like is inexplicable without the constant action of such a power, *a fortiori* so is the spontaneous production of superior creatures from inferior ones, whether by large or small steps. Every such step is a creation, whatever else it may be called.

The argument from adaptation, which the atheists pretend to refute by calling the apparent 'objects' of creation only 'necessary consequences,' I showed to be unaffected thereby. Whether the highest order of beings was the chief object for which the lower ones were made first, or only their necessary consequence, that consequence must have been equally foreseen by a power great enough to make the laws of nature, and therefore was designed. And it is infinitely easier to

believe that the world was made as it is with a view to man's existence than merely to grow vegetables for nothing, or for animals so inferior to us as the best of them are. In all other matters every person of common sense would feel sure that the highest product of any process and provision of materials for it was the real or chief object of the designer of the whole. If atheism requires a different conclusion as to the object of making the world as it is, so much the worse for it by all common rules of reasoning.

I need not repeat what I said so lately about the difficulties of accounting for the special qualities of man by any atheistic hypothesis; nor about the objection, that the present results of creation being imperfect, and evil being allowed to exist, prove that there cannot be an omnipotent and omniscient creator. We have seen that the highest authority in the automatic school defines matter to be 'the mysterious thing' by which all things were made good or evil. And so is evil a mysterious thing. But the vast preponderance of good is much more so, and entirely inexplicable and impossible, on any theory that denies a primary intelligence and design somewhere, or asserts our intelligence to be the highest, and to have grown out of the dust of the earth by the inherent potency of dead atoms having no intelligence; and I defy anybody to make out that materialism has any other meaning.

On the balance of probabilities then, which is the only mode of coming to a conclusion about things not mathematically or visibly demonstrable, and not

necessary or self-evident truths, I do not see how it is possible to doubt which of the only conceivable theories of the universe is right: the one which is indisputably adequate to account for every phænomenon, or the one which cannot account rationally or intelligibly, or in fact at all—for phrases are not explanations—for any single law or force of nature, and therefore not for anything in nature. As for professing to believe neither alternative, atheism or theism, neither that the universe began to make itself at some time, nor was made by some external power, which also keeps it going, that is not only probably but certainly wrong, and indeed is so impossible, that every man who thinks he has come to that conclusion is mistaken, and is at present an atheist, convertible or not, as it may be, by some unknown arguments hereafter; and it is of no consequence by what name any such professor of unbelief may choose to call himself.

I see no advantage in the modern title of a 'personal God,' nor do I know how much different people mean by it. An eternal, omnipresent, omniscient, ever-acting power, omnipotent in the only sense that is conceivable, can be described by no name so intelligible or so good as the old one of 'the living God,' whatever consequences it involves.

THE END.

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